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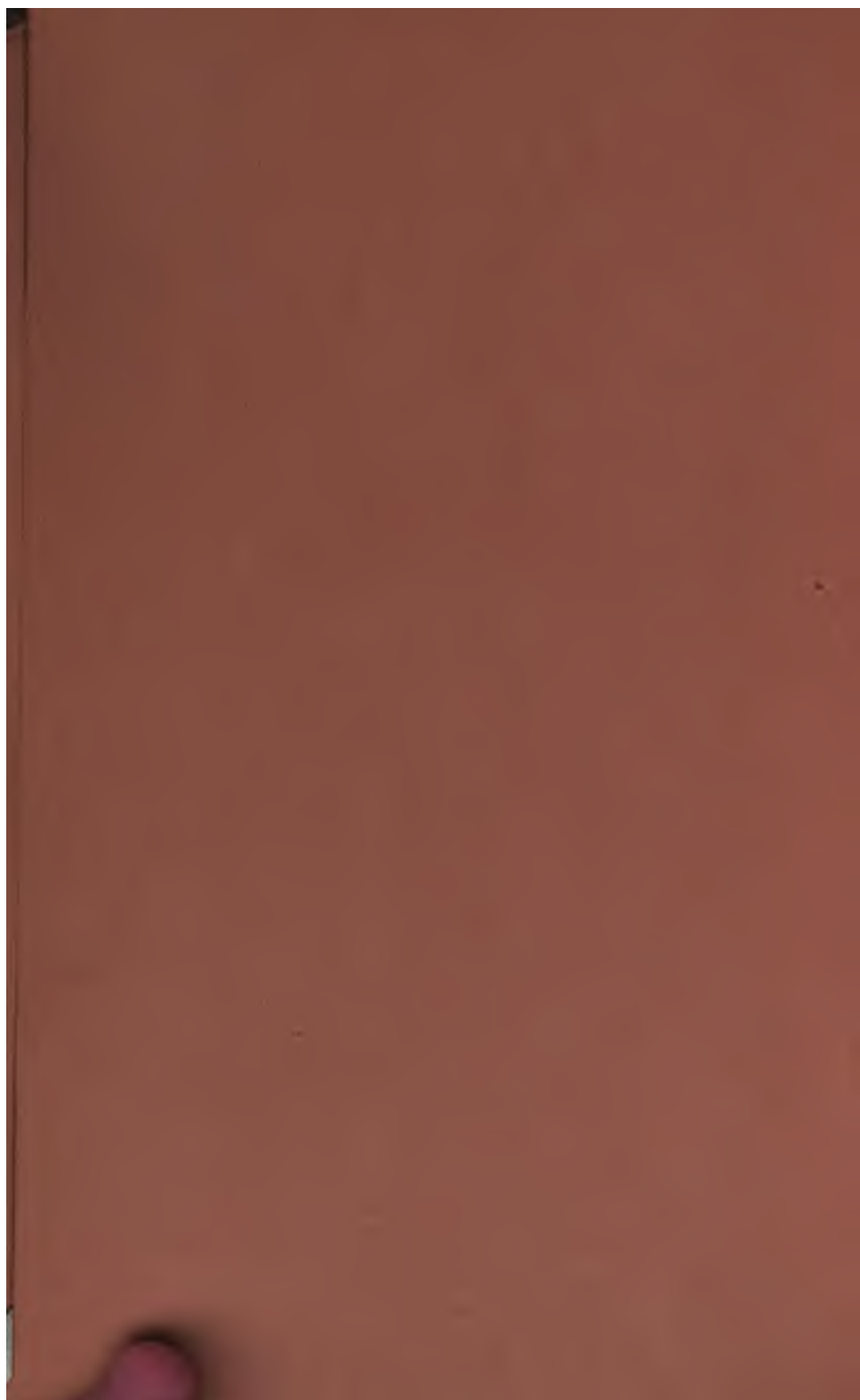
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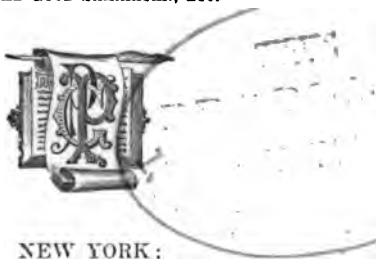
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No. 1.

THE
PRINCIPLE OF PHYSIOLOGICAL ANTAGONISM
AS APPLIED TO THE
TREATMENT OF THE FEBRILE STATE.

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THE PRINCIPLE OF PHYSIOLOGICAL ANTAGONISM AS APPLIED TO THE TREATMENT OF THE FEBRILE STATE.

BY

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ALTHOUGH you have doubtless heard much on the subject of the physiological antagonisms existing between certain drugs, it may be useful in this place to make some practical applications of the principle of antagonism to the treatment of pyrexia. With this view I purpose now to collect in a group some facts which demonstrate that antagonisms of action, similar to those which have been observed between drugs themselves, exist also to an important extent between remedies and diseased states. As it would occupy more time than can be devoted to it, to discuss this subject in its entirety, I shall confine my remarks to the treatment by antagonism of the febrile state.

To an opposition of action between remedies and diseases has been applied the term *antipathy*, a very old therapeutical principle. Indeed, Hippocrates affirms in one of his aphorisms, "in general, diseases are cured by their contraries." It is an axiom in physics, that two bodies cannot occupy the same place at the same time. Opposing waves neutralize each other—opposing waves of sound produce silence; of light, darkness. Actions taking place in a tissue of an opposite kind, whether produced by remedies or by diseased states, may be so used as to counterbalance each other.

Two actions of an opposed kind, no more than two bodies, or two contending forces, can occupy the same tissue at the same time. On these well-established physical principles, rests the doctrine of antipathy or antagonisms.

The problem which we have now to consider is, what means are available to antagonize that complexus of actions to which we apply the term fever? In order to a right comprehension of the subject we must have a clear conception of what the febrile state includes. For our present purpose, fever means increased temperature of the body. The rise of temperature above the normal is a result of greater activity of the combustion process. Or, as it has been expressed by Liebermeister (*Handbuch der Pathologie und Therapie des Fiebers*, Leipzig, 1875, p. 290), "the higher temperature of the febrile state is an exaltation of the normal heat-producing process." It is not necessary to my purpose to admit or deny the existence of Tscheschichin's (*Deutsches Archiv f. klin. Med.*, 1867, Band 11, s. 588) heat-regulating center. Whether or not there be an excito-caloric center and a moderating center of combustion in the body, does not affect the inquiry before us; it suffices to accept the definition of fever as a state of preternatural body-heat. A temperature elevated above the normal cannot exist without disturbance of other functions. Increased cardiac movement is a necessary result of the heating of the blood produced by the active combustion in the tissues. A very simple but interesting experiment, which I will now show you, has been performed by Brunton (*St. Bartholomew's Hospital Reports*, vol. vii.) to demonstrate the influence of temperature over the cardiac movements. I place upon this tin plate a turtle's heart which I removed from the living animal just before the lecture hour. In order to exhibit its movements to you all, I lay over the heart a straw lever containing at its end a disk of white paper. Every movement of the heart is thus amplified and made evident to every one in this amphitheater. You perceive that it beats regularly about forty to the minute. I

now gently warm the tin plate with the spirit-lamp. Observe the gradual increase in the rate of the heart-beat, until now the temperature has risen to such a point that the action of the heart is exceedingly rapid : it has attained, indeed, its highest rate of speed. While it is working in this rapid way, I remove the spirit-lamp and place some ice under and in contact with the tin plate. See how quickly the cooling slows the heart : in a few minutes its pulsations occur only at the rate of about ten per minute. If I continue the application of the ice I will soon arrest the movements of the heart altogether. I will not proceed so far, but will now apply warmth again, and we will witness the renewed activity of the heart : its pulsations are increasing ; already they have risen to the maximum. I apply ice as before ; its pulsations are again reduced until almost arrested. I might continue this experiment for some time, alternately increasing and diminishing the cardiac movements until the irritability of the muscle is destroyed. What we see in this experiment takes place in fever. The blood heated by the increased combustion or chemical action in the tissues warms the heart, and with every increment of heat above the normal, there occurs a corresponding increase in the cardiac movements.

Although the action of the heart is thus increased by the elevated temperature of the blood, the arterial tension is lowered. These sphygmographic tracings, I now show you, exhibit the varying degrees of dicrotism of the pulse in fever, and indicate the important decline in arterial tension which accompanies the rise in body heat. It is true, during the chill stage of fever contraction of the peripheral arterioles takes place, the skin becomes cool, and the radial pulse is small and hard ; but with the rise of temperature of the periphery, the vessels relax, the pulse becomes full and bounding, and the dicrotism begins to be evident. In the further progress of the case, if the temperature continue high, the amplitude of the pulse-wave lessens, and when at last cardiac par-

alysis is threatened, the pulse-trace is a mere, slightly undulating line. Just as in the experiment on the turtle's heart, when continuous heat is applied, the maximum rate of cardiac movement is soon attained, after which the exhaustion of the irritability of the cardiac muscle ensues, so in fever, a persistently high temperature causes, if long continued, paralysis of the heart.

The changes produced by fever heat are not limited to the circulatory organs. Important functional disturbances and even structural alterations occur in the brain and nervous system, in the muscles and in the parenchyma of the thoracic and abdominal organs. The changes functional and organic to which I now call attention are not those due to the growth and multiplication of cæcobacteria and other organisms, or to morbid materials (unorganized) circulating with the blood through the organs and setting up, by their presence, morbid processes; but those alterations due directly or chiefly to the abnormal temperature. These anatomical changes have been designated by the German pathologists, "parenchymatous degenerations." As respects the muscular system these changes have been especially studied by F. A. Zenker (*Liebermeister's Handbuch*, l. c., p. 445), who describes two forms—a *granular* and a *waxy* degeneration. As these changes occur in various febrile diseases and are extensive just in proportion to the degree of fever heat, he concluded that the principal factor in their causation is the temperature. In this opinion he is supported by Liebermeister. The changes in the parenchyma of organs (*parenchymatöse Degeneration*) have also been studied by Lehmann (*Ueber das Verhalten der parenchymatösen Entzündungen zu den acuten Krankheiten; Schmidt's Jahrbücher der Gesammten Medicin*, Band 139, s. 239, *et seq.*), by Ponfick (*Anatomische Studien über den Typhus recurrens, Virchow's Archiv*, Band 60, 1864, s. 153), by Klebs (*Zur Pathologie der epidemischen Meningitis, Virchow's Archiv*, Band 34, s. 327, *et seq.*), by Liebermeister (l. c.), and by others.

Without entering too minutely into the nature of the changes designated parenchymatous degeneration, it will suffice to state that it consists chiefly in a granular and fatty metamorphosis of the cellular elements of the liver, kidneys, pancreas, salivary glands, etc. These anatomical alterations, which are extensive in proportion to the elevation of temperature, must have an intimate relation to the fever heat. Whether a consequence of the elevated temperature, or a cause of it, or due, as Zenker supposes, to some alteration occurring in a hypothetical regulating center of nutrition, is not known.

We are not without experimental evidence showing the dependence of the symptoms, in fever, on the increments of heat. A very elaborate and instructive series of experiments by our countryman, Dr. H. C. Wood (*A Study of Fever, Toner Lecture*), have thrown much light on the mechanism of fever. He concludes from his experiments that "external heat applied to the body of the normal animal, so as to elevate the temperature, produces derangement of the nerve functions, of circulation, etc., etc., precisely similar to those seen in natural fever; the intensity of the disturbance being directly proportionate to the rise in temperature."

Although characteristic alterations, microscopic, have not thus far been discovered in the brain which can be referred to the elevated temperature of fever, it is probable that careful microscopic investigations will detect granular degeneration of the cells of cerebral matter, similar to that which takes place in parenchymatous degeneration of the other organs. Clinically, it has been abundantly ascertained, and confirmed by experimental research on animals, that high temperature affects the functions of the brain, and there is a distinct ratio between the amount of disturbance in the cerebral functions and the degree of fever-heat. Liebermeister (l. c., p. 481) divides these disturbances of the brain into four or more stages of severity, which correspond closely to the range of temperature. Paralysis of the functions of the

brain ensues from excessively high body-heat, just as paralysis of the heart ensues from the same cause.

If the disastrous results of a continued high temperature are such as I have just briefly sketched, of course the most obvious indication of treatment is to diminish this abnormal heat. The remedies employed for this purpose are called *antipyretic*; they are the opponents or the physiological antagonists of the febrile state. As heat is to be abated, no practice can be more natural than the use of cold in some form. It is really remarkable how the domination of theory or dogma over men's reason led to the use of so many other means of treatment than the simple and natural employment of cold. It is true, Currie of Liverpool, at the close of the last century, and Nathan Smith of this country (*Memoirs by N. R. Smith*), early in this century applied cold water with remarkable success in the treatment of pyrexia, but the method did not gain favor and was not generally adopted. The neglect of a means of treatment so rational, probably, was influenced by the empirical practices of Priessnitz and his followers. A truly scientific application of the methods of the water-cure was not possible, however, until thermometry and the study of temperature in disease had been sufficiently advanced to establish some laws or principles as a guide to therapeutics. We owe to Wunderlich our present accurate information on the subject of thermometry, and to Brand, Jürgensen, Ziemssen, Immermann, Liebermeister, and some others, the establishment of hydrotherapy upon a scientific basis. Now, the range of temperature being known, precise indications exist for the use of those means by which the heat is diminished. When a fever patient with a temperature of 105° , 106° F., or even higher, is placed in a bath cooled from 96° to 60° F., we know that the abnormal heat of the surface is abstracted, and the blood in the peripheral vessels is cooled. The effect of the external cooling is to lessen the cardiac pulsations and to limit or prevent those important changes caused

by the abnormal heat—the parenchymatous degenerations. Von Ziemssen and Immermann, influenced in their practice by the periodical variations of the heat in fevers, direct the baths to be administered at 6 A. M., 1 to 3 P. M., and 7 P. M. The duration of a bath is determined by the influence which it has on the temperature and by the state of the patient; the time of administration of the bath should be determined by the fever-heat; and the frequency, by the influence which the bath has on the subsequent elevation of the temperature. It is simply a question, *ceteris paribus*, of the degree of heat and the amount of cooling necessary to abate it. To illustrate this I could repeat, if time would admit, the experiment of Wood, in which an animal heated in a hot-air chamber until the febrile state is induced, is restored to the normal condition by being plunged into a cold bath.

Although for the condition of high temperature, especially for hyperpyrexia, cold baths must be regarded as the most appropriate remedy, we are nevertheless in many inflammatory affections restricted to the use of antipyretic medicines—chiefly, quinia, digitalis, aconite and veratrum viride. These are, also, depressants of the temperature—antagonists to fever; but they differ among themselves in their mode of action, and hence are governed in their administration by special indications.

Quinia. In the physiological state, in doses less than lethal, quinia exerts but little influence on the temperature. Some years ago (*Russell Prize Essay*), in some experiments on my own person, I had ascertained that twenty grains of quinia reduced the body-heat not more than 0.5° F. to 1° F. Ringer has more recently arrived at the same result. Although this reduction of temperature is positive, it is not conspicuous. The antipyretic effect of quinia is much greater in fever, especially in malarial fevers; but in order to produce a decided lowering of the body-heat in continued fevers, it is necessary to administer very large doses. Liebermeister (*Handbuch*, 1. c., p. 635), influenced by the practice of Vogt and Wachs-

moth, gives from a scruple to a drachm on each day or on alternate days, and he insists that the whole amount be administered within an hour. Small, even considerable doses, given at intervals through the twenty-four hours, although they may in the aggregate reach the largest quantity mentioned above, do not affect to a very appreciable extent the abnormal body-heat. On the other hand a single large dose causes a marked decline in temperature, which is sustained for a number of hours. The effect of such a dose is not entirely expended at the end of twenty-four hours, and continues, indeed, sometimes even longer. From its point of maximum depression, which may be near normal, the temperature subsequently rises slowly to the degree, or somewhat lower, to which it had attained previous to the administration of the antipyretic. The repetition of the dose on the next day, or on the second day, will depend on the state of the temperature. As the thermometer affords the indication for the repetition of the cold baths in fever, so it must be used to guide the administration of quinia. So high is the estimate of Liebermeister of the value of quinia as an antipyretic in fever, that he declares if he were restricted to a choice between baths and quinia, he should select the latter. That Vogt and Wachsmuth were the pioneers in the use of quinia as an antipyretic in fever in Germany is no doubt true, but this heroic practice had advocates long before in other countries. In the *Medical Statistics of the U. S. Army*, 1839 to 1855, we find that single large doses of quinia in pyrexia had long been the mode of administration of this agent adopted by the surgeons of the Army in malarial fevers, in yellow fever, and, by some of them, in typhoid. Dr. Robert Dundas, of Liverpool, in a work entitled, "*Sketches of Brazil; including New Views on Tropical and European Fever*," etc., based on twenty-three years' experience at Bahia, enunciated the doctrine that "large and frequent doses of quinia will arrest the course of continued fever," and that "typhus fever may be arrested by cinchonism."

This work was published in 1852. The use of quinia in large doses as an antipyretic in fever was thus distinctly taught in this country and in England at least six years before the first publication by Vogt (May and June, 1858), and ten years before the paper of Wachsmuth's appeared. (*Archiv der Heilkunde*, 1863, p. 55.) The systematic and exact application of quinia to the treatment of pyrexia was not possible, however, until the use of the thermometer had demonstrated the range of temperature in fevers. Our German *confrères* have therefore this merit—they have placed the quinia treatment of pyrexia on a scientific basis.

We have now to consider the mode in which quinia antagonizes fever. Accepting the definition of fever already given, quinia lowers fever-heat by checking the combustion process. Cold baths act by abstracting heat. Various facts have been ascertained in regard to the mode of action of quinia. It is destructive of minute organisms; it suspends the activity of protoplasm; it hinders the oxidizing power of the blood. Let me enter into some details in regard to these several powers and properties.

That the reception and multiplication of minute organisms in the body will produce certain febrile states, is now generally accepted. What Oertel has shown in regard to the bacteria present in diphtheria, and Obernier, the spirocheite plicatilia found in such immense numbers in relapsing fever, is probably true of other septic and infectious maladies. With the progress of research doubtless other specific germs will be defined, and their forms and modes of propagation will be explained. How important then the use of a remedy which may be exhibited in sufficient quantity to destroy these minute organisms without affecting injuriously the normal structures of the body. We owe to Binz the first accurate investigations of the antiseptic and antiferment properties of quinia, (*Virchow Archiv Pharmakologische Studien über Chinin*, Band xlvii., pp. 57 and 129); although powdered cinchona bark had long been used as an antiseptic dressing to sloughing and ill-

conditioned wounds. It was, also, Binz who first demonstrated the influence of quinia on protoplasm and on the amœbiform movements of the white blood corpuscles. These observations have been confirmed and extended by Binz's pupils Scharrenbreich, Martin, and Kerner, and by Geltowsky. (*The Practitioner*, June, 1872.) The last-named, however, has shown that the reaction which ensues on the stage of the microscope between quinia and white-blood corpuscles, does not, also, take place in the body. The effects of quinia on protoplasm differ in different individuals and vary in the same individual at different times. (*Ueber die physiologische Wirkung des Chinin, von Dr. Nicol Jerusalemsky*, Berlin, 1875).

The antipyretic powers of quinia are due in large part, doubtless, to the property which it possesses of checking the ozonizing action of the blood. This important discovery we owe to Binz. (*Archiv f. exper. Pathologie und Pharmacologie*, B. 1, Heft 1.) Although we are not in a position to demonstrate the action of the several factors concerned in the production of animal heat, there can be no doubt that the chemical changes in which oxygen partakes are very influential. A remedy which lessens the capacity of the blood as a carrier of oxygen, must depress the heat-producing function of the body. A consideration of these facts cannot, I think, fail to convince you that the several properties of quinia, as developed by modern research, are opposed to the actions of fever—in other words, that it is a physiological antagonist to that complexus of morbid phenomena which we denominate fever.

I have now to call your attention to some very important questions connected with the action and uses of certain other antipyretic medicines—*Digitalis*, *Aconite*, and *Veratrum Viride*. These are much used, without due discrimination, in the treatment of fevers. An adequate conception of their real powers should always precede their therapeutic applications.

Digitalis, like quinia, has the power to lower the temperature in

fever, but, in order to avail ourselves intelligently of this influence, we must know how the result is accomplished. I place before you now a rabbit which, two hours ago, received, by subcutaneous injection, twenty minims of the tincture of digitalis. He is confined, you perceive, in a Czermak's rabbit support, and a delicate thermometer is kept in the rectum. When the injection was made the temperature was 102° F.

At the end of twenty minutes it was	101.2°
“ “ thirty “ it was	101°
“ “ one hour it was	99.5°
“ “ one hour and a half it was	99°

At the present time the temperature is 98.6°. There has occurred, you perceive, a reduction of three and a half degrees in the temperature of the rabbit since the experiment began. The quantity injected is not a lethal dose for a rabbit of this size. The maximum effect has already been attained, and the temperature will soon rise again to the normal. You will ask me, probably, why I did not use the active principle, digitaline, instead of the tincture. I reply, the so-called active principle, digitaline, whether amorphous or crystalline, is itself, most probably, a complex body, as shown by Schmiedeberg (*Archiv f. exper. Path. u. Phar., Band 3*), and does not, we have good reasons for suspecting, represent the powers of the drug in their entirety.

Wunderlich and Traube have maintained that decided antipyretic effects are produced by digitalis in fever. To the influence of Traube is due, more especially, the introduction of digitalis as an antipyretic. Liebermeister (*Handbuch, p. 642*), who employs digitalis in substance, usually gives from ten to twenty-three grains in the course of twenty-four to thirty-six hours. When quinine alone does not produce a decided impression on the temperature, he combines digitalis with it, and finds that the combination is more effective (p. 643). His method consists in giving the digitalis in the quantity and in the period above stated, and following

with a full dose (40 grains) of quinia. In this way a marked remission in the temperature is produced. Liebermeister holds that a weakened heart is a contra-indication to the use of digitalis in fever—the opposite rule to that which obtains in cardiac diseases. I have not felt inclined, in my own practice, to make use of digitalis as an antipyretic in typhoid. This drug, in considerable doses at least, so commonly produces nausea and vomiting, and is so apt to increase the diarrhoea, that its utility as an antipyretic appears to be quite counterbalanced by such untoward results.

The power of digitalis to lower animal heat in the physiological state is the same as its antipyretic effect in fever, and both facts are demonstrable. It is necessary now to inquire, What is the mode in which lowering of the temperature is accomplished? Having formed an adequate theory on this point, you will be prepared to investigate some important questions connected with the use of this remedy in various diseases.

It is admitted on all hands now, that digitalis increases the energy of the cardiac movements, while it diminishes the number of the beats. It is, therefore, entitled a tonic to the heart. While it thus lessens the rapidity, but increases the power of the cardiac pulsations, digitalis raises the arterial tension. So energetically does it act on the organic muscular fiber of the arterioles, that the lumen of the vessels may be very visibly encroached upon. (Ackerman: *Volkman's Klinische Vorträge*, No. 48.) The reduction in the number of the cardiac movements, and the lessened caliber of the arterioles, must produce, to a considerable extent, ischæmia of the arterial system. The blood-supply to the tissues being lessened, the activity of the heat-production is necessarily diminished, and a fall of temperature must result. Most observers note a diminution in the amount of chlorides and of urica in the urine of those taking digitalis. It certainly increases the amount of urinary water by raising the blood-pressure in the kidneys, and also, as

Brunton has shown, by a direct action on the Malpighian tufts.

It must be obvious, I think, from a consideration of its physiological actions, that digitalis is an antagonist to that complexus of morbid symptoms entitled *scarlatina*. In this malady the action of the heart is rapid, the arterial tension low, and the body-heat great, and excretion by the kidneys is embarrassed. Theoretically, the range of antagonism is complete, and theory is, in this instance, abundantly supported by clinical observation. It would occupy too much time to detail cases, and I must content myself with the mere expression of results. In a considerable experience in the treatment of scarlet fever, digitalis has been uniformly successful. That it will arrest the morbid process, is, of course, not affirmed. Scarlatina is a self-limited disease, which varies immensely in severity ; but it passes through its stages, whether mild or malignant. That digitalis will modify the fulminant form of this disease is hardly to be expected. But, taking in a group the ordinary cases of scarlatina simplex and scarlatina anginosa, I venture to affirm that we possess no remedy so efficient in their treatment as digitalis. In these cases the chief dangers are the pyrexia, with the consequent parenchymatous degenerations ; the catarrhal or parenchymatous nephritis, in consequence of which, elimination by the kidneys is diminished or arrested. Digitalis obviates both of these sources of danger ; it lowers the temperature, and maintains the action of the kidneys. As, in scarlatina, a gastric catarrh of considerable severity hinders the digestant and absorbing powers of the stomach, it is important to administer the remedy in an easily assimilable form. The *infusion* of fresh English digitalis, if practicable, only should be used, and this may be administered in a teaspoonful to a tablespoonful dose, according to age, once in four hours. A *thoroughly trustworthy tincture may be used* instead of the infusion. As depression of the fever-heat and increased urinary excretion are the objects to be accomplished, the quantity

of digitalis necessary to effect these results must be administered. The state of the pulse, the degree of arterial tension, and the range of temperature, are the indications to be followed.

The physiological antagonism which exists between the actions of digitalis and the complexus of morbid symptoms constituting pneumonia (fibrinous or croupous), are certainly very notable. In order to exhibit this opposition of actions in the clearest manner, I have placed them in parallel columns :

DIGITALIS.	PNEUMONIA.
Contraction of arterioles and diminished blood-supply.	Hyperæmia of part, and dilated vessels.
Exudation checked or prevented by the heightened tonicity of the vessels.	Exudation of fibrinous material. Migration of the white blood corpuscles.
Depression of the temperature.	Elevated temperature.
Lessened action of the heart and increased power. Arterial tension raised.	Increased action of the heart and lessened power. Arterial tension lowered.

In any estimate of the utility of a remedy in pneumonia, we must not overlook the fact that it is a self-limited disease, that it has its period of crisis, and that the resolution of the inflamed tissue is frequently announced by some critical evacuation. There are two periods, speaking from the point of view of my personal experience, in which digitalis renders the most important service in pneumonia, viz., during the stage of hyperæmia and exudation to limit the area of the inflammatory action, and at the period of crisis to maintain the power of the heart. I believe I am justified in stating that the temperature range will be lower, that the crisis will occur earlier, and that the depression of the critical period will be less when the case is treated with digitalis than when treated with any other means. I am, therefore, quite in agree-

ment with Traube in the high estimate which he places on the utility of digitalis in the treatment of pneumonia.

In the use of digitalis in the treatment of fevers and inflammations, it cannot be too strongly insisted on, that to obtain good results, genuine English digitalis must be employed; that the state of the pulse and temperature must be the guides to the dose and the periods of administration. *To counterbalance a series of pathological phenomena, some physiological effects of the opposing agent must be induced.*

Aconite. The mention of aconite is almost sure to excite suspicion in the minds of the highly conservative—it has a taint of homœopathy about it. It is a singular fact that this drug is used by homœopaths in direct contradiction to their own tenets. It is well known that it is employed by these quacks in the treatment of fever to which it is not homœopathic but antipathic. It opposes in its physiological effects most of the symptoms of fever. In the physiological state it depresses the circulation and lowers the body-heat, and in the condition of pyrexia it slows the heart and diminishes the abnormal temperature. As an antagonist to fever, aconite deserves attentive consideration. I have prepared an experiment to illustrate the power which it has to lower the temperature. To this rabbit, in the Czermak's support, weighing sixty-four ounces, there was administered an hour ago twenty minims of the officinal tincture of aconite. The temperature was then 102° F.

In half an hour the temperature had fallen to 101.6°

In an hour, 99°

At the end of two hours it will be found that the temperature of the rectum has descended as low as 98° F. One of the students in attendance at the College last year, swallowed by mistake a teaspoonful (equal to sixty minims) of the tincture of aconite root. When I saw him, at the expiration of two hours, he was cold as a

frog, pallid, sweating, and with a pulse so feeble that it was scarcely distinguishable. His axillary temperature was 96° F. Under vigorous stimulation and artificial warmth he recovered. Numerous instances of the same kind have been reported. Such accidents are even more instructive than experiments on animals. Both means of observation, however, coincide in demonstrating that the special rôle of aconite is to lower the body-heat.

The mode in which aconite causes a decline in temperature is very different from the action of digitalis. As Liégeois and Hattot (*Schmid's Jahrbücher der Gesammten Medicin*, Vol. 114, p. 291) and Ascharumow (*Ibid.*, Vol. 136, p. 157) have shown, aconite lowers the blood-pressure, suspends activity of the motor and sensory centers of the spinal cord, and destroys the contractility of the cardiac muscle. It does not affect the caliber of the arterioles. The action of aconite on the circulatory system is, indeed, antagonistic to that of digitalis, as has been shown by Fothergill in his admirable essay on Digitalis. The decline of body-heat produced by aconite is the result of its paralyzant action on the heart and organs of circulation, whence it follows that the consumption of oxygen and the chemical interchanges between the blood and tissues are diminished.

It must be very apparent to you, I think, that as antagonists to the fever process, digitalis and aconite occupy very different positions. It is rare, indeed, that aconite can be admissible in the treatment of essential fevers—diseases characterized by depression in the functions of circulation and respiration. It is especially to the treatment of inflammatory states with sthenic reaction, when the pulsations of the heart are strong, the arterial tension high, and the muscular power unimpaired, that aconite is adapted. We find these conditions present in the first stage of pneumonia, pleuritis, peritonitis, cerebro-spinal meningitis, surgical fever, acute rheumatism, etc. Whenever the heart begins to flag, aconite ceases to be useful and may be dangerous. This remedy is es-

pecially serviceable in the inflammatory diseases of childhood, when a condition of high temperature is associated with elevated arterial tension. It has the important merit, furthermore, that it is easily administered to children. As a rule, small doses, frequently repeated, are more manageable and beneficial than larger doses at longer intervals. A drop or two of the tincture of the root, according to the age of the subject, and every hour, is, probably, the most efficient mode of giving the remedy in order to maintain a constant physiological action.

The utility of aconite as a remedy in inflammations is not limited to its antipyretic action. It powerfully affects the skin and kidneys, increases elimination through these emunctories, and thus disposes of the waste products of inflammation.

Veratrum Viride. Like digitalis and aconite, veratrum viride slows the heart and depresses the temperature, but as regards mode of action it differs from both of these agents. In order to illustrate its most obvious effects, I have administered to this rabbit, weighing sixty-four ounces, five minims of the officinal tincture. The rectal temperature before the experiment began was 102° F.

In fifteen minutes the temperature fell to	101°
In thirty “ “ “	98°

At the present time, an hour since the drug was introduced, the temperature of the rectum is but 97.5° F. Corresponding reduction in the pulsations of the heart have taken place, but this action is exhibited in man more suitably for our purpose. Without any danger it is comparatively easy to reduce the pulsations of the heart from seventy-two to fifty, even as low as thirty-five, in a healthy adult. As veratrum viride is powerfully nauseant, this considerable reduction in the pulse-rate can rarely be effected without exciting excessive nausea and vomiting.

You perceive at once that two of the most important of the ob-

jective phenomena of fever are antagonized by *veratrum viride*, but in order to have an intelligent comprehension of the indications requiring this remedy, we must know the mode in which it acts to produce these results. The depression of the cardiac movements is due to an action on the cardiac muscle and its contained ganglia. The heart muscle is paralyzed and the ganglia are deprived of their power to evolve force. General vaso-motor paresis and consequent fall of the blood-pressure are also induced by *veratrum viride*. This agent agrees with aconite in being a spinal depressant and paralyzer, but you will remember I pointed out the fact that aconite does not affect the vaso-motor nervous system. The influence which *veratrum viride* has over the cardiac movements, and the temperature of the body, is undoubtedly due to its paralyzing action on the functions of the nervous system both of animal and organic life. The temperature falls because the circulation is much less active and the tissue changes are therefore retarded. In other words, the chemical processes concerned in heat production are much less energetic for want of the material necessary.

A due consideration of the mode in which *veratrum viride* produces its physiological effects, must greatly restrict its applications in the treatment of pyrexia. In fevers it should be used sparingly if at all. In all adynamic states it is clearly inadmissible. When, as is the case in fevers, the action of the heart is enfeebled by the paralyzing effect of the high temperature and by the granular degeneration of its muscular tissue, *veratrum viride* can only do harm. The special indication for the use of *veratrum viride* is an abnormally elevated arterial tension. This state of the circulatory system may exist in pneumonia, pleuritis, peritonitis, and in other acute inflammations at an early stage, before exudations have taken place. If administered at the right period, excellent results may be obtained from *veratrum viride*. Used so as to lessen the amount of blood passing to and in the inflamed part, it may check the morbid action by withholding the pabulum necessary to the process.

In pneumonia more than in any other acute inflammation has this agent appeared to be most serviceable. But I cannot too strongly insist that its usefulness ceases with the exudation process—for then the increasing difficulty in the pulmonary circulation, the stasis on the venous side of the heart and the ischæmia of the arterial circulation will not only render the depression of the cardiac action a useless expedient, but will add a danger to those already existing.

Salicylic Acid. In the time which yet remains to me I should say something of the new antipyretic—salicylic acid. Although opinions differ somewhat on this point, the weight of authority is certainly in favor of the antipyretic action of this remedy. Butt (*Die antipyretische Wirkung der Salicylsäure. Centralblatt f.d. Med. Wissenschaften*, 1875, No. 18), who has employed it in typhoid, erysipelas, acute rheumatism, etc., regards it as an efficient antipyretic: “*die Salicylsäure ein ausgezeichnetes Antipyreticum ist.*” Immermann in a communication to Liebermeister (*Handbuch l.c.*, p. 644) expresses considerable confidence in the efficacy of large doses of salicylic acid in the treatment of pyrexia. His experience is based on its use in two hundred cases, including typhoid, malarial fever, pneumonia, phthisis, acute rheumatism, etc. He affirms that the duration of the antipyretic effect is about equal to that of quinia. Fürbringer (*Zur Wirkung der Salicylsäure*, Jena, 1875), who has examined this question experimentally, concludes that salicylic acid does not lower the temperature in the physiological state, but does exercise some influence over septicæmic fever—putrid infection.

Since the introduction by Thiersch of the use of salicylic acid in antiseptic surgery, its action as an antiferment has been elaborately studied by Kolbe (*Schmidt's Jahrbücher*, vol. 163, p. 229), by Letzerich (*Virchow's Archiv*, Band 64, p. 102), Salkowski (*Berliner klin. Woch.*, No. 22, 1875) and numerous other experimentalists. Its power to destroy ferments and minute organisms, and to arrest the activity of protoplasm, is now perfectly well-known.

It is as efficient, or nearly so, as carbolic acid, and as it is without toxic power, can be administered internally in sufficient quantity to produce positive results. With its action as an antiseptic agent in surgical practice, we are not at present concerned. The problem now before us is, what is the mode in which salicylic acid produces antipyretic effects? As it does not appear to possess the power to influence the temperature in the physiological state, the antipyretic effect which it has in the febrile condition can hardly be due to interference in the combustion process. Fürbringer has demonstrated the important fact that salicylic acid appears to have some special and peculiar power over that form of fever caused by the introduction of septic materials into the blood. Letzerich has shown that it is destructive of the bacilli which play so important a part in the local morbid process in diphtheria. Although our knowledge of its actions is not yet sufficient to enable us to form very positive conclusions, it seems in a high degree probable that the antipyretic effects of salicylic acid are due to its power to arrest the activity of disease germs and disease-producing organisms, and to destroy infectious material and ferments.

If the conclusions which I have thus presented to you are warranted by the facts, antipyretic remedies are not to be administered without precise indications. It will not suffice to ascertain the existence of fever, and then prescribe an antipyretic. The particular conditions of the febrile state must guide our selection of the remedy. When the state of pyrexia is the most important element in the morbid complexus—cold baths, quinia, and digitalis are the remedies to be employed. In the fever of inflammation, is the action of the heart vigorous and the arterial tension high? aconite and veratrum viride are indicated; is the action of the heart feeble and the tension of the vessels low? quinia and digitalis are more appropriate. Is the fever due to putrid ferments, to disease-producing organisms? quinia, salicylic acid are required. By a careful study of the phenomena of the febrile state, and of the physiological ac-

21] PRINCIPLE OF PHYSIOLOGICAL ANTAGONISM. 21

tions of antipyretic medicines, we may successfully oppose one to the other, and by setting up interferences may stop morbid action. By this method, also, we may arrive at the same exactitude in results as has been obtained by counterbalancing the effects of certain poisons by the introduction of their physiological antagonists.



ON CERTAIN FORMS OF MORBID NERVOUS SENSIBILITY.

BY

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GENTLEMEN :—I wish to call your attention, to-day, to a class of cases in which the most prominent clinical features relate to nervous sensibility.

Before I give you the clinical history which is to follow, I must make a few remarks as to the nature and seat of nervous sensibility.

Among the very few general functions of the nervous system, the most fundamental, perhaps, is that of sensibility, or the capacity of feeling. So far as the nervous system is concerned, this capacity—not *power*, as it is sometimes called—is enjoyed in an undoubted manner only by nerve cells, whatever certain writers, like Mr. Lewes, for example, may have said to the contrary.

The capacity of feeling does not seem to be possessed, at least in the same degree, by all nerve cells, but more especially, though not exclusively, by certain tracks in the cerebro-spinal axis, which, whatever their limits may be, are called sensory.

Superficially speaking, there are two kinds of nervous sensibilities, viz., sensibility with, and without consciousness, the latter being involved more especially in unconscious reflex action.

Nervous impressions, however, produced on sensory nerve fibers, are conveyed in them to sensory nerve cells, as a rule, per-

haps, and the slight disturbance thus produced is felt in some way at present unknown. And when we become mentally conscious of this slight change in the sensory nerve cells, we have an exhibition of nervous sensibility, in the full sense of the word. The nerve fiber does not feel in the way we are now supposing, if at all. This is, as already said, the prerogative of the so-called sensory nerve cells. And this capital fact, simple as it may appear to be, should be remembered when dealing with the infinitely varied forms of morbid nervous sensibility. It is one of those facts which may prove, when properly used, a very clue of Ariadne in guiding us through an otherwise labyrinthine maze.

This capacity of feeling may vary greatly in the same cells, under different circumstances. It may be either more or less acute than natural. It may differ not only in degree, but there is some reason for thinking in kind, even in the same cells.

Not to mention special sensibility, it seems possible, and even necessary, to distinguish several different kinds of general sensibility, such as that of temperature, of touch, of pain, etc. Either of these different forms of general sensibility, it seems, may be separately exalted, diminished, or perverted, or even abolished, without of necessity involving a similar change in the other forms of sensibility for the same parts.

But I will not carry our physiological analysis further at present. I will pass to an account of certain cases of a change in degree of sensibility, rather than kind, and especially those in which it is increased to a point above the normal level. My effort will chiefly be to point out to you the conditions on which the state depends, and its treatment.

The first case to which I will direct your attention is that of a Mrs. S., aged 41 years, married late in life, and the mother of one child, now four years old. She has a nervous temperament, rather light complexion, light hair, and blue eyes. She is quick and lively in movement, in motions, and temper, and has come from a

nervous but otherwise healthy family. Mrs. S., prior to seeking advice, had been for months watching with an invalid mother, who finally died of some form of lung disease.

To the loss of sleep, irregularity in habits, and the physical and mental exhaustion incident to prolonged watching, she attributes her present bad health, at least in great measure. But prior to this, she had headache, irregular appetite, occasional constipation, and, sometimes, disturbed sleep. These symptoms she has had, at times, ever since the birth of her child. She menstruates somewhat irregularly, and at times has leucorrhœa and some pain in the sacral region, in the small of the back and through the hips, all of which latter symptoms are aggravated at the recurrence of the menstrual period. There is no cough; there is no fixed pain anywhere. There are no decided chills or fever, except at rare and irregular intervals. There is no paralysis, and in fact no evidence of any serious local disease anywhere, not even in the pelvis. But one condition is present in her case in a very high degree, viz., abnormally exalted nervous sensibility, and this is manifested in almost every form and sphere, whether in the physiological or psychological relations. She is, or seems to be, sensitive to almost every touch on the skin, but particularly over the spine, along many parts of which there is well marked hyperalgesia, rather than hyperesthesia, while in other parts these two states appear to be combined. Though the skin has almost a normal temperature, yet she complains inordinately of cold impressions when they are made. There is very slight photophobia, and moderate use of the eyes, especially if the gaze is intent or fixed for a few minutes, it gives rise to dizziness of the head, feelings of intra cranial pressure, especially at the top of the head, pain in the occipital region, formication in the skin of the upper extremities and upper portion of the trunk, and sometimes of other parts of the body. Besides these phenomena and others, vaso-motor disturbances in the skin of the fingers, more especially of the pal-

mar surface, appear; and palpitation of the heart, embarrassed breathing, and feelings of nausea and faintness arise upon fixed use of the eyes. But the most careful examination I have been able to make, does not show any defect in the vision, as regards the capacity for adjustment, etc., which might account for the symptoms I have just related.

Her hearing is acute, more so than natural. She has frequent ringing in the ears, and sometimes other abnormal sounds, but they are not constant in kind nor duration.

Our patient cannot rise up suddenly after sitting or lying, or stoop down, or as she lies sometimes cannot turn in bed; so she will rest on one side, and thus disturb the equilibrium of the intracranial circulation; nor can she apply herself mentally without experiencing in all these cases confusion and vertigo.

If she becomes exhausted, she can feel her heart beat, and the pulsations of the arteries in many parts of the body, even at fingers' tips.

At times she can feel the peristaltic movements of the bowels with startling distinctness, or the presence of food in the stomach, or of fecal accumulations in the lower bowels, if she becomes constipated, or the presence of urine in the bladder, even when it is moderately distended. A slight sound, if unexpected, and more particularly if unusual in character, gives her a most uncomfortable start, affecting momentarily the action of nearly the whole muscular system, and also for some time the action of the vascular system. In other words, reflex excitability of the nervous system is greatly exaggerated in her case.

She is just as morbidly excitable in her emotions, especially those of a depressing character, as she is in respect to her mere physiological sensibilities. She is easily distressed and filled with anxiety by slight causes, whether arising out of her own condition or of her surroundings. She is especially alarmed at the various changes in her feelings that occur and vary almost hourly, unless

her mind is pleasantly occupied with company, or in some other way. She is as weak in will power as she is in muscular power. Nervous weakness may show itself in either or both of these ways.

But it is unnecessary for my purpose to carry the description of the case of Mrs. S. any farther. It is a somewhat familiar example, in clinical experience, of morbid nervous sensibility. The very abundance of cases which involve essentially the same pathological conditions as the one I have described, invests them with great practical importance.

The pathological conditions underlying this case will be found present in hundreds of others which differ from it only in their extent and the grouping or peculiar character of their symptoms. If this is so, it is a matter of importance for us to have a correct knowledge, if we can obtain it, of the nature of the condition of the nervous system itself, out of which these many-hued and morbid forms of sensibility spring.

In the present case there is no evidence whatever of serious local nervous disease. If so, there must be some general condition for which we should seek. In respect to the nervous system, by common consent we have provisionally two classes of diseases: *structural* and *functional*. Structural disease, as a rule, and, I believe, always, involves functional disease. To this statement few would be found to object. But whether we can have functional without structural disease, is still a question with many, at least. But in my judgment, there is no such thing as a functional disease, in the proper sense of the word. Every change in function must arise out of some definite change of structure somewhere, as well as lead to it. I know it is often true that such a change, if it occurs, is not susceptible of demonstration. But neither can its absence be proved. But the evidence, such as it is, and as far as it goes, is all in favor of the view that all functional change begins and terminates in structural change.

If this doctrine is applied to the case in hand, it necessitates

the view that the changes in sensibility which it includes, have underlying them some material changes. I have already said there is no evidence, in the present instance, of serious, and I will go farther and say, even of demonstrable, structural disease of the nervous system. But I am sure of the existence of an actual widespread material lesion, on which the enduring but shifting morbid phenomena of our case depend. This conclusion, is simply an inference from well known facts, but scarcely less convincing, because there is no direct proof of its truth.

Even in the natural and physical sciences, this matter of proof or evidence, viewed broadly, has two sides, that are complementary to each other ; the one is comprehended under the title of *direct, positive, or physical proof* ; the other is the *indirect or inferential*.

To this latter class belongs the evidence which goes to show the fact and nature of the lesion in cases like the present one.

My conclusion is, that in the case, the history of which has been recited in your hearing, there is a lesion of nutrition, which consists in a more or less serious loss of balance, as between waste and repair, and on the side of the former. For a long time, waste has been going on at a more rapid pace than repair. No action can take place in the nervous system, more particularly a nervous center, except there is a proportionate waste of its material structure. No one doubts it, or can doubt it, if the facts are regarded. Hence the necessity for continuous or, at least, frequent repair. But repair, to be thorough, requires the fulfillment of two conditions at least, viz., *rest*, and *nutritive materials*. As regards the nervous system, the first is obtained by a simple cessation or a change of activity, or, best of all, by sleep, which may be defined as nerve rest. The second depends on a full supply of pure rich blood. These propositions no one will dispute. In health, when the process of waste of structure, in the course of nervous activities, has gone to a certain pass, a sense of fatigue warns us that we need rest so as to secure repair,—the natural outcry for which is

the sense of fatigue, with which you are all familiar. Under ordinary circumstances, the rest is taken, and, the materials being present, repair goes on until the nervous structure has been restored to its former or a healthy condition, and is once again ready for a period of action. This, I say, is the ordinary course. And these facts are none the less important for us to consider, because in a general way we may be acquainted with them. You must remember that golden rule, too little recognized, that, if we would advance to the unknown, *that our course must be from the known to the unknown.*

If what has been said is true, I think it will not be difficult for you to see, how it is possible for a loss of balance to occur between these two great phases of nutrition in the nervous system, viz., between *waste* and *repair*. And it may happen in one or both of two ways : it may depend, on the one hand, on inordinate activity of the nervous system, or some part of it, in which it is worn away, wasted in its material structure, faster and for longer periods than should be. There is too much action and too little rest, and hence too much waste or too little repair, or both ; and hence the loss of balance described. On the other hand, these may not be judged by ordinary standards,—too much action or too little rest—but there may be a path from these things, a poverty of materials for repair, so that when the waste has once occurred, as it must do to a certain extent while we live, there is not enough nutritive matter in the blood, from which to repair the damage, and so the balance is lost in this way, as certainly as from the other side. Now, these are not mere speculative views, they are eminently practical ; and we will not require to follow them much farther, until they will lead us to rather unfamiliar grounds. As we proceed, let us not for a moment lose sight of these simple homely truths. Both of these ways of impairing the structure of the nervous system, may be, and frequently are, operative, in the same case. In ninety-nine cases out of a hundred, of nervous

disease, you will have to meet with this lesion of nutrition about which I am speaking, produced in one or other or both of the ways I have just described.

Other and grosser forms of disease of the nervous system, may exist at the same time. But in very many cases that differ widely at first sight, you will not be able to find anything, either before or after death, to account for the symptoms, except the inferred lesion of nutrition, about which I am speaking.

I must also say to you that while it may affect the whole or any part of the nervous system, as it often does, that it may involve only very limited portions of it, such as a small segment of the spinal cord, or the nucleus of any nerve cranial or spinal, or any part of the brain. All that is needful, is too much action, too little rest, or a defective nutritive supply, or all may prove true in the same case, and lead to the required intimate impairment of structure which I wish to make clear to your minds.

That such an impairment of nervous structure may occur, none will dispute.

Now, what are the next steps in the morbid process? It seems to me they are very easy to declare. A material loss of structure, such as we are now contemplating, cannot be sustained without a corresponding loss of *power*. There can be no doubt of this. It is shown in loss of muscular power, in loss of will power, in weakness of memory, sometimes, or incapacity for long mental exertion, or for enduring either suffering or pleasure. We all experience it daily, or see it in others. If the waste of the material structure is repaired, its power is restored *pari passu*, as a rule. But, if it is not repaired, then there is corresponding loss of power which is permanent, until the damaged, worn structure is restored. But this is not all. Just as new power is lost, or lowered, in the way I am supposing, just in that proportion do certain of our nervous sensibilities become more acute. I say *certain of them*, for they do not all become so; as the sense of vision, for example.

The sense to which I would more particularly allude, as being morbidly exalted, is that of pain, and the exaltation of this phase of sensibility is one of the characteristics of our case. The sense of tact or touch may be increased in acuteness, and reflex excitability is exalted, as a rule, when the lesion of nutrition is present, to which I have invited your attention.

The nervous centers become so unstable and responsive when in this impaired state, that the slightest centripetal impressions are capable of arousing reflexes, altogether disproportionate, in energy, duration, and extent to their cause, as compared with the natural course of such things. And this is exemplified in our case, as you will recognize by recalling its history. It is rather customary in considering these cases of hyperesthesia, hyperalgesia, exalted reflex excitability, etc., to fix their organic seat in a vague way, in the peripheral nerves, or surface; but, in my opinion, this is a grave error. I do not say that the condition of the nerve fibers plays no part in these cases of morbidly exalted sensibility, but I am prepared to affirm they have but little to do with it. They are not the seats of sensibility proper. Feeling does not occur in them, though ordinarily it does not without them. It is accomplished in nerve cells. They are its true seat. Nerve fibers have no more to do with it pathologically, than they do physiologically. By impairing or destroying a nerve fiber, you may prevent feeling, but do not thereby destroy the capacity of feeling. But if you destroy the nerve cell, however perfect its related nerve fiber, you have not simply prevented feeling by cutting off communication with its objects, but you have destroyed the capacity itself. The nerve cells, or centers, are the proper objects on which our attention should be fixed in cases like the one under consideration. Here alone will the key be found to their complexities.

By reason of over-action, or, to state the matter another way, on account of insufficient rest, and hence imperfect repair, the nervous centers are brought into that mobile, unstable, sensitive state.

which is the ordinary condition on which the phenomena of morbidly exalted sensibility depend.

This exaltation of the sense of pain, is, under the circumstances, a wise provision in nature for preventing destructive waste. It is the natural outcry of the worn nervous system, which cannot be quieted naturally and permanently, except by a restoration of organic comfort, through a repair of the damage, on which the phenomena in question clearly depend.

That the true condition of the nervous system, in these cases, has been set forth, is shown by what we know of the conditions of nutrition, by what we daily observe in the progress of such cases, from their commencement to their recovery. Nearly all of them show a history of over-action, too little rest, of strain, of irregular or defective nutrition ; and nearly all are improved by rest, especially sleep, change of occupation, recreation, good feeding, and appropriate tonic and sedative treatment.

Besides what I have already said, I must remind you of a most important matter, in these cases, viz., the neurotic temperament, or, beyond this, even the hereditary tendency to painful neuroses. There can be no doubt of its existence and importance, from every point of view.

People are born into the world daily, with painfully sensitive and unstable nervous constitutions, pre-disposed to neuralgias, chronic nervous exhaustion, etc., by which, under the operation of ordinary natural causes, such as act with impunity on the average person, they are soon exhausted, their nervous sensibilities harshly played on, and they are brought, practically speaking, into the state I have been describing in this lecture.

To discern this hereditary element, is practically important, and, at the same time, discouraging. You may predict, as a general rule, that hereditary nervous states are immeasurably more difficult to cure than those which are acquired.

Before passing on, I must call to your attention, more fully,

that the lesion of nutrition I have been describing has its mental, or psychological, as well as its physiological side. There is a morbid increase, not only in nervous sensibility, proper, but emotional as well, giving rise to painful emotional states, often more distressing to bear than ordinary physical pain.

And this state, in such cases, does not arise simply, or at all, from the so-called moral causes, but out of the sensitive, weakened condition of the nervous system, more particularly of the brain, which is the part of the nervous system that earliest shows the effects of a loss of balance as between waste and repair, in various degrees and ways, but especially in casting a painful influence over the emotional nature of the individual. This state has been described, or at least certain phases of it, quite recently, by no less a student of such conditions than Dr. Krafft-Ebbing, as "Psychical-neuralgia,"—a morbid increase of emotional pain, or of susceptibility to it. Both forms of painful sensibility, whether physical or mental, are rooted in the same or similar conditions of the nervous system.

I have no hesitation in ascribing the morbid phenomena in our present case to such a condition of the nervous system as has been described.

You have the nervous temperament, the period of beginning decline in life, the over-action and lack of rest, the prolonged defect of nutrition, the gradual wear and tear of the nervous system, and the consequent phenomena of her case. I am far from ascribing all the symptoms to this condition, but it is the central and commanding one, for practical purposes.

And not hers alone, but for those of hundreds of others. I had intended to have commented at length on one other case, but I will not have the time. I can show you, though, how important a part this nutritive lesion of the nervous system plays in many other forms of nervous disease.

For example, it exists in what is called "spinal irritation," but

which has been ascribed to circulatory derangements in the spinal cord, especially to "anemia" of the cord, one high authority in our own country limiting the anemia to the "posterior columns of the spinal cord." But, instead of these modes of explaining spinal irritation, I would refer them to a decided loss of balance, as between waste and repair in the spinal cord through over-action, on the one hand, and defective nutritive supply, on the other, or in both of these ways.

The histories and best modes of cure of such cases, all point to this view as the correct one. And it is nothing against it, that very limited sections of the cord are frequently the seat of trouble. Over-use of the arms, as in sewing, or type-setting, or in playing on the piano, or any other mechanical operation requiring rather constant and severe use of the hands and arms, will produce a tender and painful condition of corresponding portions of the spinal cord, as in the lower cervical and upper dorsal regions. Occupations which require a steady and delicate use of the eyes, the head being at the same time bent downwards, will often give rise to a painful and irritable condition of the centers of vision and upper section of the cord. Over-use of the lower extremities, as in walking or in the use of the sewing-machine, in which one or both lower extremities are employed to propel it, will lead to the same nutritive lesion of the lower part of the cord, and hence to the symptoms of special irritation.

Disease of an irritative character, as of the mucous membrane of the stomach, will sometimes act on the upper and middle sections of the cord, with which the stomach seems to be connected by means of certain nerves, so as to produce the same painful state. The cord becomes worn and irritable, under the steady irritative influence exerted on it from the diseased stomach.

The effect is the same as if the part had been overworked, in the normal way. I have often seen a tender and irritable spot on the spinal column, at about the fifth dorsal vertebra, made more sen-

sitive after taking a meal, especially if the food was difficult to digest, or if the food should ferment rather than digest, and the stomach should become distended with gas. Under such circumstances, I have seen not only increased sensitiveness, but spontaneous pain arise and continue in the region of the spinal column referred to, and, sometimes, radiate into the chest or shoulders, or down the arms. Irritative disease of any lower section of the alimentary canal, as of the colon or rectum, as in dysentery, or of the genito-urinary organs, will often produce morbid sensitiveness of the lumbar portion of the cord, such as we see in certain forms of spinal irritation, so-called.

From affected parts of the cord there are frequently radiating pains down the arms or up into the back of the head, or along the course of the intercostal or abdominal nerves, or down the lower limbs, which depend largely on the painful and irritable condition of the corresponding portions of the sensory tracts of the cerebro-spinal axis, and which condition has, underlying it, the nutritional lesion, about which I have spoken to you.

The pains are referred to distant parts, in accordance with the well known, but practically speaking not much thought of, law of eccentric projections of Romberg, which declares that an impression made on a sensory nerve fiber, in any part of its course, or even in the perceptive center to which it leads, is referred by the mind to the periphery of the related fiber or fibers.

There can be no doubt in my mind but that the nutritional lesion I am describing may affect any sensory or emotional center (if such as the latter exists), in the cerebro-spinal axis, as in many, perhaps all, forms of neuralgia, and in many forms of hyperesthesia, of whatever kind or degree, and as in the majority of painful and depressing emotional states.

There is one feature of the case before us to which I must call especial attention, viz., the vertigo and confusion of mind which occurs upon a change of posture, or follows a change in the rate or force of action of the heart.

After much attention to such cases, I believe them to depend on two conditions: 1st. Increased sensibility of the brain, especially to changes in blood-pressure, and, 2d. A variable, unsteady intracranial circulation. I have known patients so sensitive to changes in vascular pressure within the cranial cavity, as to be scarcely free from some disagreeable sensations about the head during waking hours.

Feelings of pressure within the head, of confusion, of unsteadiness, and vertigo, with various morbid phenomena appertaining to vision and hearing, are among the most common symptoms arising from the conditions of the brain I have mentioned. I have never witnessed such symptoms unless due to some local disease of the brain or its vessels, when they did not seem to me to depend on the nutritional lesion to which I have called your attention in this lecture. Under such circumstances, the brain becomes sensitive to impressions that ordinarily pass unnoticed, and especially to those of varying vascular pressure and varying degrees of vascular distension. This condition is true in our present case in a marked degree. These symptoms will not disappear in the present case, we may safely predict, until through rest and a greatly improved nutrition the brain becomes more solid and resisting, and hence less sensitive than it is now. But I cannot go farther into the development and application of the views with which it has been the object of this lecture to make you acquainted. I only have time to draw certain practical considerations, growing out of the previous discussion.

If the condition of the nervous system, in these cases, is as I have supposed, the indications for treatment are not difficult to declare. They are as follows:

1. *Comparative rest.*
2. *An improved nutrition.*
3. *Means to allay nervous irritability.*

These are the prime indications for treatment, whether hygienic or medical.

As regards the first, viz., *rest*, the reasons for it grow naturally out of the pathological condition. If there is a real loss of balance as between waste and repair, on the side of waste, the recommendation of comparative rest is eminently rational and natural. By this means the chances of final repair are enhanced in a way easy to be understood. It requires, however, a very close scrutiny to determine, in many cases, whether their conditions are such as to be benefited by rest. There are some cases which may easily counterfeit those in which rest is necessary. Moreover, the question as to the value of passive rather than active exercise is an important one. But I cannot, in this lecture, give you a full exposition of the benefits and dangers of *rest*, in the class of cases I have been describing. I would recommend you to read the excellent lecture by Dr. S. Weir Mitchell, of Philadelphia, on the subject of rest in the treatment of nervous disease, and which was published last year in the American Clinical Lectures, edited by Dr. Seguin, of New York, in which this subject is treated in an interesting manner.

But I am safe in saying that the necessity and value of rest, physical, mental, and emotional, in the various forms of neurasthenia, is only beginning to be understood by the profession.

By this means you can retard waste, and indirectly contribute to repair, for in this way what is gained will be saved. And in the acquisition of nervous strength, as in the accumulation of wealth, as much depends on what is saved as on what is made. Let me commend this subject to your careful attention.

The second indication is for an improved nutrition. But this subject will never be well understood neither by your patients nor yourselves, without more than ordinary attention. It is not enough to tell your patients they must eat nutritious food, contenting yourselves with such generalities. Your knowledge and your instructions on this point should be most explicit, both negative and positive. You should tell your patients not only what they may

eat, but what they may not eat. They should absolutely confine themselves to the most nutritious diet, such as good, tender beef-steak or roast beef, as nearly as may be, to the exclusion of all other meats, except for an occasional change. But no form of animal food can, as a rule, worthily replace good beef. Then the best light, stale wheat bread, made of the best spring wheat, used, as nearly as possible, to the exclusion of all other kinds of bread. Hot bread should be avoided, and especially those coarse varieties which so many persons wrongfully imagine are more wholesome and nutritious than the best of fine wheat bread. In addition to the beef, milk, cream, eggs, butter, cod liver oil, and the fats in general, where they can be taken, are eminently useful. In addition to bread, on the vegetable diet list, we should admit a few articles, chief among them potatoes. But the more nearly the patient can be confined to the best possible beef and bread, the better.

All confections, pastry, cake and marginal dishes of every kind, which, as a rule, are not taken so much for the nutritive matter they contain as on account of their savory taste, should be avoided. Pure nerve stimulants, such as coffee, should, as a rule, be avoided. They only stimulate to the expenditure of the stock of nervous energy already on hand, and do not, in any sense, stimulate or improve the process of nerve nutrition.

This whole matter of the diet of such patients must be rigidly and specifically regulated. I am not aware of any more important point in the treatment of such cases. Of course it is necessary to closely watch the digestive system for evidences of disease, and, whenever found, the endeavor should be made at once to correct the morbid state, for the great highway toward the recovery of such cases lies through the digestive system.

To aid in the restoration, nutritive tonics—those which quicken the processes of nutrition, such as phosphorus, strychnia, quinine, etc., should be faithfully employed. Care should be taken in giv-

ing phosphorus, especially if given in solution, in oil, or in the form of pill, for it is a decided irritant to the gastric mucous membrane, and may, in this way, seriously impair digestion. I have often seen this happen, and am persuaded but few practitioners are as fully alive to this fact as they should be.

I have been greatly pleased with the action of the acid phosphate of lime, the phosphoric acid being in excess. It not only does not irritate the stomach, but it is an excellent appetizer, if cautiously used.

Iron is indicated, if the mucous membrane of the stomach is free from irritation, and the blood is deficient in red corpuscles.

The fats may be introduced by inunction, if the necessity exists for their use, as it generally does, especially if the stomach does not receive them well. They may be used at the same time that *massage* or shampooing is employed.

This mode of passive exercise, let me say, if judiciously used, in combination with other passive movements, such, for example, as are practised in the so-called movement cure, form one of the best means to further recovery from the states I have described to you. But, to give this kind of exercise, of the right kind, at the proper time, and in the proper degree, is a matter of great importance, and hence requires study.

The judicious use of baths of various kinds, especially cool shower baths, and the proper time and modes for their use, should be remembered in this class of cases.

I would not omit to mention the use of electricity, not only for allaying nervous excitability, but as a means for exciting the nutritive processes, especially in the spinal cord, by the method of central galvanization, or, rather, electrization. Either the galvanic or induced currents may be used, the one agreeing better with some cases than the other. I have been especially pleased, however, with the action of the induced current. It may be employed by causing the patient to place one or both feet on an electrode,

and putting the other electrode on the back of the neck, in the lower cervical region ; and it is well to use the hand as an electrode on the neck. But I have no time for entering into details in regard to the best methods of applying electricity. I must refer you to some one of the many excellent manuals which treat of this subject. But, you will find electricity, if intelligently and faithfully used, one of your most effective agents in the treatment of nervous disease. As regards the use of sedatives for allaying nervous excitability, it is not possible for me to enter into this subject as it deserves. But, among the best are moderate doses of one of the bromides, if they do not irritate the stomach, and especially the solid Extract of Ergot, usually called *Ergotine*.

The efficacy of this remedy is seen only after a rather prolonged use, and in doses of from two to five grains. Its usefulness seems to be much enhanced in certain cases by combining with it Extract of Digitalis, in doses of from one-sixth to one-quarter of a grain. This is all the more needful if the circulation is fluctuating or unsteady, as it so often is, and if the heart palpitates much. In these cases it is a matter of no small consequence to maintain a steady equable action of the vascular system. In certain cases, especially those in which the pupils are rather large, I have found marked benefit to result from the use of Physostigma. It seems, in general, to diminish reflex nervous excitability, which is so often exalted in cases of the kind now under consideration. But I cannot undertake to go more at length, at present, into the management of the morbid condition I have endeavored to set before you. In my opinion, it is one of the most common and important subjects, practically speaking, with which you are liable to meet. As such, I make no apology for earnestly commending it to your attention.

THE TREATMENT OF MILD CASES OF
MELANCHOLIA AT HOME.

BY

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GENTLEMEN.—The little patient, now before you, is the subject of a very rare disease—Intermittent Melancholia. He has been under my observation and treatment for about fifteen months. The history of the case condensed from numerous notes made during that period, is as follows :

Agie Van R——, aged 11 years, is the child of poor parents who have not had insanity or other nervous disease ; they are simply ill-nourished and small. Agie himself enjoyed good health until, in the winter of 1873-4, he injured his head by falling backward from a stoop. The scalp was cut through at a point midway between the right ear and the occipital protuberance. The blow was severe enough to produce loss of consciousness lasting several minutes. No symptoms followed this injury, and its occurrence was not remembered by the mother, until long after the mental affection had manifested itself. At the time of the patient's first appearance at my clinic, Dec. 19th, 1874, the following notes were made in the clinic record : " Was perfectly well to July 12. Had been out in the sun ; fell asleep, and slept nearly half the time for two days. He was out of his head ; restless ; singing senseless songs ; eating everything ; was cross ; recognized everybody ; complained of head-ache ; could not walk straight. In two weeks became en-

tirely well. After an interval of two weeks, he had another attack in which he was sleepy and out of his mind. Probable hallucinations of vision in this second attack. For some time had such attacks regularly on the fourteenth day, lasting fourteen days. Agie states that in attack before the last (October), he thought he saw bears and thieves entering the room. Last month was treated by Dr. Woolsey Johnson, in Professor A. Clark's clinic, with quinia, obtaining an interval of four weeks. Present attack began on Dec. 13th. Is drowsy, restless, and wants to lie down; many parts of the body are the seat of twitching. Is dull and speaks slowly, when questioned; denies head-ache; is cross; lies in his mother's lap; pupils normal; sulphate of quinia to be continued. The attack terminated Dec. 24th, and he was then given 1-4 grain strychnia, and the mother was directed to apply the wet-sheet." This treatment did not prevent the return of attacks, in January and February, 1875.

"February 8th.—Was well up to yesterday noon, then was rather low. At supper, fainted dead away (fit?) and vomited afterward. To-day, looks anxious and depressed; eyes have lost brightness; he slept, but has been singing, this morning. Pulse, 90. Ordered bromide of ammonium, grs. 5., and bromide of potassium, grs. 10., every four hours. Feb. 10th.—Has a depressed, sad look; is restless; whistling, chuckling, mimicking, singing. Restless last night. Fundus of eyes, normal. Only complaint is of pain in right hinder part of head, and some dizziness. Feb. 15th, eighth day of attack.—Is depressed, noisy, and ill-behaved; pulse, 90. Ordered stop bromides, and take strychnia again, and a teaspoonful of whiskey, several times a day. Feb. 22d.—About well; wants to go to play. March 9th.—Melancholia appeared again yesterday: is depressed, and looks pale; not noisy. Pressure on cicatrix in right occipital region, causes a bad feeling in stomach. Mch. 10th.—Patient is etherized, and an incision is made through the scar down to the bone, and a pea put in. Cicatrix

is found whitish and tough, adherent to thickened periosteum. Father states that in fainting fit of February 7, the boy's face twitched, and he lost consciousness wholly. This statement is to be received with much allowance, as the father is evidently a chronic inebriate. Mch. 11th.—No worse ; still dull and anxious-looking ; not noisy. Dressing of wound, while not causing much pain, produces bad feeling in stomach ; faintness ; at first flushing of the face, then pallor ; no twitching or loss of consciousness. The strychnia was stopped a few days ago and the bromides resumed, with whiskey. Mch. 19th.—Coming out of an attack ; wound is still open (pea dressing), and pressure on it is felt in the stomach. Mch. 22d.—Since yesterday morning has been bright and quite himself. Dressing of sore on head produces pallor, sweating, temporary loss of consciousness. Takes iodide of potassium, grs. 20, three times a day. April 5th.—On the 3d, awoke irritable and queer ; interval a little less than fortnight ; yesterday, slept much, ate a great deal, whistled, and sang. General dread without hallucinations ; will not go into room alone. Sore is allowed to close up. Ordered bromides of ammonium and potassium, grs. 5. of former, grs. 10. of latter, thrice a day, and a double dose at bedtime. Pulse weak and irregular, about 75 ; tongue clean."

During an attack beginning May 3d, the bromide treatment was abandoned and opium given in doses of gr. 1-4, four times a day, to be gradually increased to six and seven times, if no drowsiness appeared. "May 7th.—Yesterday was noisy at times ; to-day, is quiet and respectful in my office. This morning asked for newspaper and read the news to his mother ; when he is well he does not care to read a paper. Continue the opium, gr. 1-4, six or seven times, food and stimulants ; pulse, 75. May 13th.—Is much better ; dressed himself, walked out alone, yesterday. Curiously, he has slept less, in the day-time, since taking opium ; yesterday, was not at all drowsy. To have opium gr. 1-2, four times a day. May 16th.—Perfectly well ; attack lasted only eleven days, and was

very light. Continue opium, food ; cod-liver oil in one dose. May 27th.—Remains well. Continue treatment. June 14th.—Has been well for nearly five weeks ; looks and feels well ; has taken two grains of opium a day, regularly, and began to feel its soporific effect only on the 10th, and since. Lately has had no cod-oil. To resume oil, and take less opium, gr. ss., thrice a day for a week, then twice a day. June 17th.—Was well up to 1 P. M., yesterday. At 2 P. M. was found by his mother sleepy and taciturn ; slept all the evening. No physical or moral cause of attack can be discovered. To-day has usual depressed, anxious look, is not noisy, has no hallucinations ; tongue is clean ; pulse, 93. Ordered opium, gr. ss., five and six times a day. June 19th.—Not as noisy as in previous attacks. No effect from pills, though he takes seven a day. July 17th.—Has been well three weeks and three days." I made no note of the case during July and August. "Oct. 19th.—Was well eight weeks yesterday. To-day, mild depression ; is not noisy. A fortnight ago, took opium for a week in small doses. Has had cod-oil more or less regularly. To have opium gr. ss., five or seven times a day, according to effect. Oct. 27th, tenth day of attack.—Is brighter and better ; sleepy from opium. In this attack was not at all noisy ; wept at times. Ordered continue two opium pills a day ; also strychnia gr. 1-40 in Horsford's acid phosphates."

During the later autumn and during the last two months, Agie has had long intervals of health, ranging from nine to five weeks, and has had but three attacks. He is now emerging from one. During January, he took fluid extract of ergot, 3ss., four times a day, and last month Thompson's solution of phosphorus 3ss., thrice a day. Cod-liver-oil has not been used since the new year. On the whole, very great progress has been made in the case, especially if we take into consideration the bad surroundings in which the little fellow has been placed ; his insufficient food, and various depressing moral influences in his home.

Many months ago I urged his mother to place him in an asylum, but she preferred to run the chances attending a treatment at home. It is remarkable and gratifying that, in spite of such numerous attacks of melancholia, no dementia has developed. In connection with this case, I would ask your attention to several considerations of ætiology and treatment, though, before doing this, I ought to present a summary of the symptoms exhibited by our patient. Naturally, and when well, he is a very bright, cheerful, and intelligent little fellow ; with brilliant eyes, red cheeks, and strong lines of character in his face. His deportment is unusually good, and his politeness remarkable for his station in life. He is, I am told, very affectionate, and attentive to his mother and sisters. During an attack, he is entirely metamorphosed. His face is drawn, and sad, the light has left his eyes, and the color almost departed from his cheeks ; his attitude is relaxed and careless, his dress is disordered, his hair uncared for. His good manners have vanished ; he keeps his hat on in my office, asks for fruit while waiting in my dining-room, whistles, kicks the furniture, answers questions reluctantly and in a cross way. At home, he does not stir from a corner or chair, will not rise from the bed or dress himself, unless forced to ; is ravenous and noisy. He has several times had hallucinations of sight, never of hearing. He has (not in every attack) complained of pain or dizziness in the head. Once he fainted (twitched ?), at the beginning of an attack. His digestive organs have always been in good order. He has been both drowsy and sleepless in different attacks. I took his temperature many times and found no deviation from the normal standard ; the pulse has ranged from 68 to 100, and I was never able to make out a regular rise in its frequency during attacks ; though, on the whole, it has then seemed to range higher. Pallor and some emaciation were present, last year. I caused him to be closely watched for epileptiform seizures, without result.

As regards the mode of production of the attacks, I have thought

of several causes. When the boy was first brought to me, I at once investigated the question of self-abuse, or genital irritation, and obtained a negative result; the organs were found healthy, and the boy repeatedly declared his freedom from the evil habit referred to. It then occurred to me that the attacks of melancholia might be the result of slight or unobserved epileptiform seizures, and, to elucidate this question, I caused Agie's parents to watch him closely, and made strict inquiries into his past life. As seen in the history of the case, only once was anything observed, which might pass for a fit, on February 7, 1875, when he fainted "dead away," and his father, an unreliable witness, thought that he twitched. Against the epileptiform nature of the disease we have, furthermore, the failure of treatment by the compound bromide solution given in large doses from the beginning of February to the end of April. When, during the month of February, I learned of the injury of the head, it occurred to me that a morbid state of the meninges under the injured bone, might be the cause of the symptoms. I accordingly performed an operation, and kept a sore running for weeks, at the seat of injury, but without relief. I was not prepared to advise trephining until a further trial of medicines had been made. The opium treatment appears to have had the best effect, when conjoined with cod-liver oil and other tonics. The approximate success obtained during the last six months by these means would point to mal-nutrition of the brain, as a cause of the melancholia: a pathological state not rare in the melancholia of adults.

Another case which has been treated at the clinic, and with greater success than the preceeding, is that of Mary L., a married woman, aged 25 years, brought here August 29th, 1874. "Has been married about four years, and has borne two children, nursing them both. About two and a half years ago, after the birth of the first child, she experienced a choking sensation in her throat; felt as if she wanted to cry. This disappeared after a while, but

re-appeared after the birth of the second child, a few months ago ; the attacks of choking being preceded by a sense of cold in soles of feet and at wrists, accompanied by nausea, and by desire to weep. Is low-spirited and imagines that she is going to be sick, or that some disaster is to happen. Has nursed child constantly and freely, and has besides had sexual intercourse very often. Is thin, pale, and weak. Facies very despondent, patient is convinced that she cannot get well. Confesses that for many weeks she has had fearful impulses, to go and drown herself in the river, and to kill her children. The latter impulse surges up frequently within her, and she has had to fight hard to resist it. She has made it a rule to lock up all knives or other sharp instruments in her rooms ; and lately, has by her express wish, been closely watched by a woman in the day, and by her husband in the evening. Denies most positively having had any hallucination of sight or hearing. Has been careless of her home, of her dress, and person ; has lost interest in everything ; is extremely depressed, and often weeps. Reasons well upon all matters which usually are talked of by a woman in her station of life. Remembers everything well. Is inert, and indisposed to take any exercise. Often very wakeful at night.

I recognized this as a case of melancholia, without delusions, but with strong morbid impulses. There had also been an hysterical element in the case. The causes of the exhaustion of physical and mental vigor were evidently prolonged lactation and too great sexual indulgence. I at once began a treatment based upon this view of the pathogeny of the case, enforcing weaning of the child, separation of the husband and wife at night, and ordered food and tonics. She was given ale at night, meat and other nutritious food thrice a day ; was made to walk every day. In order to secure sleep, I prescribed a pill containing half a grain of extract of *cannabis indica* and one quarter grain of powdered opium, to be taken three or four times a day, according to the effect produced. The patient was in the habit of rising at night to answer any cry of her

infant child, and this was prevented by having a woman take entire charge of the child. At all times, Mrs. L. was to be under guard to aid her in resisting the impulses described above. She was to stay a part of the day in her husband's store, and do what little she could to help him. Her husband and friends were strictly enjoined to do or say nothing tending to depress her or excite her emotions. I told the patient in the most positive terms that she would recover in a few weeks, and re-iterated this assurance at every visit, though she often shook her head and said it was no use. Cod-liver oil was added to the treatment in October, and the number of opium and cannabis pills was reduced, at first, to two a day, later, to one at bed-time. On October 5th, I gave her, after meals, a pill containing extract of nux vomica one-quarter grain, zinc phosphide one-sixth grain, and zinc oxide one grain. This was discontinued on October 23d, and a mixture substituted, each drachm dose of which contained 1-24 of a grain of strychnia, and half a drachm of Horsford's acid phosphates, with half a drachm of syrup of orange flowers. At first, Mrs. L. took three doses; later, in November, four doses a day, continuing the cod-liver oil and ale. The last prescription which I wrote for this patient was on November 24th, 1874, when I gave her five grains of pyrophosphate of iron three times a day. At that time she was perfectly well. The improvement had appeared very soon after the patient began to rest at night, and ceased exhausting herself. She gained flesh and color rapidly, and, *pari passu* with the physical gain, came a mental improvement; greater tranquillity of mind, a little hope of recovery, interest in matters of every-day life, and ability to banish every thought of injuring others. I urged the patient to exert her volition to the utmost, when such ideas arose in her mind, and to seek relief from them also in occupation. Corresponding with these changes in the bodily and moral state of the patient, a degree of healthy coquetry made its appearance, as shown in the arrangement of hair and dress.

A case, similar in many respects to the above, occurred in my private practice during the past autumn.

Mrs. Lev., aged 27, came to my office, September 22d, 1875. She had been married six years, and had had four children in that time, not nursing any of the children, and not having any complications in labor. Last confinement occurred in January last; and after it, she was not well; her children were sick and she obtained but little sleep for four months. Had pain at top of head and in left side of abdomen, nausea, and pain at the pit of the stomach. A physician in Mobile made an examination and found the uterus "ulcerated." Was frequently purged, and received local treatment, with relief to nausea, pain in the head and abdomen. She, however, grew weak under this treatment. In the last few months, chief symptoms have been mental and moral; the patient has become despondent, wished for solitude, expressed her inability to do anything, and her conviction that she is crazy and will not recover. Her sleep has been unrefreshing, and she has not seemed to gain any strength from food. Lately, the negative mental state has become very pronounced, and patient must be urged to rise, to dress, to eat, to go out. She is apprehensive of softening of the brain, etc., and states that her head feels dull and stopped up; she feels childish, foolish, and irritable. Shakes her head incredulously, when I tell her that she is sure to get well. The memory is a little impaired for recent events; there is no incoherency in speech; no delusion; and patient denies having had any hallucinations. She is conscious of the feebleness of her will, and of the torpid, helpless state in which she is. Complains of no pain, but has, at times, creeping sensations over the whole body; sometimes is a little dizzy, and has a feeling of pressure at the back of the head. Has a tender point in mid-dorsal region, and before treatment of uterine disease, had one in the lumbar spine. The menses have appeared irregularly at five or eight weeks' interval, have been copious, and have caused weakness. There are now no

symptoms of uterine disease. The fundus of the eye is normal ; the face pale, and the patient's eyes underscored with black. She has become emaciated, and is comparatively weak. This patient often said that she had rather die than be in the state she was, but never had any strong suicidal impulse, and never any desire to injure anyone. The prominent psychological state was the negative condition, in which she found herself without reaction to the usual stimuli of life. She said that she could not rise in the morning, could not dress, could not take medicine, could not walk out. "I am worse than a child," was her oft repeated complaint. I made the diagnosis of physical prostration and melancholia sine delirio, and encouraged her friends to believe that she was to recover in a few months. Toward the patient I adopted a more positive tone, and told her that she would get well surely, positively ; and that before Christmas, she would be a healthy woman. This statement I repeated as a part of the treatment at every interview.

I prescribed a moral and a medicinal treatment. In the first place I instructed the friends of Mrs. Lev. to watch her constantly, because, though there was no tendency to suicide then present, such a disposition might be suddenly developed, and an attempt made to gratify it. The patient was to be aided by the will of others in all things ; she was to be *made* to rise at a certain hour, if necessary, by the stern means of taking away her bed-covers. She was to be helped and expedited in the operation of dressing, and brought down stairs in time to breakfast with the family. The same punctuality was to be enforced in other things. Regularly, also, she was to be taken out walking, twice a day at least ; and, after a while, when better, I directed that she was to be obliged to take care of her room. Now, gentlemen, this was not tyranny, as one unacquainted with the subject might think, but a kind assistance to the patient. She was glad that the will of others was interposed to help her out of the negative state into which she

had drifted. Of course, in carrying out this course, no physical violence was to be used. I told the friends to throw the odium of enforcing disagreeable things upon my shoulders by saying : "The doctor says it *must* be done."—"You promised the doctor that you would do it," etc. I furthermore enjoined them never to deceive the patient in order to make her do anything or to gain her good-will. This means is one which I believe should very seldom be resorted to, in mild cases of insanity. In addition, Mrs. Lev. was to be amused moderately, invited to play cards or backgammon, and later, when stronger, was to be taken to matinees at the theatres.

In the second place, I ordered the following medicinal treatment : The patient to go to bed at 10 o'clock, after drinking the better part of a bottle of porter. Her three meals were to be substantial ; meats, eggs, etc. With her dinner she was to take a pint bottle of porter. Cod-liver oil was prescribed in doses of 3i after each meal, to be slowly increased to 3ss ; and gave I her $\frac{1}{4}$ gr. of phosphorus, in the shape of 3ss of Thompson's alcoholic solution, thrice a day. The galvanic current was applied to the head a few times, with the effect, apparently, of relieving the dysæsthesiæ, of which she complained. October 5th ; not much improved in mental condition ; it is difficult to enforce rules of life prescribed ; patient still very obstinate and quite hopeless. The cod-liver oil and phosphorus are given together in an emulsion, according to the following formula :

R. Vitelli ovor.
 Ol. morrhuæ aa 3iv.
 Vini xerici 3ij.
 Sol. phosph. (Thompson's).
 Syrup. simpl., aa 3ss.
 Aq. amygdal. amar. 3iv.
 S. 3j after each meal.

On October 11th, there was added to the treatment a pill of cannabis and opium $\frac{1}{2}$ gr. each, to be taken at bed-time with the porter. October 29; great improvement, physical and mental; patient begins to believe that she will recover; shows more spontaneity; she shows disgust for the emulsion of phosphorus and oil, and is ordered Caswell's oil with hypophosphites of lime and soda, 3ii after meals, to be increased. Porter, twice a day, as before; opium and cannabis at bed-time. In the early part of December, Mrs. Lev. was very much better, almost herself in fact. I directed that the opium and cannabis pills, and the cod-liver oil be no longer given, and prescribed the following tonic and stimulating pills:

R. Ext. cannabis, gr. iij.

Ferri sulph., exsicc.

Sodæ carbonat. aa 3ij.

M.

In capsul. no. xxx divid.

S. Two after each meal.

By Christmas time, recovery was quite complete. The patient became anxious to go back home, to care for her house and children, and was only prevented from going by being led to expect her husband from week to week. Until his arrival, in February, 1876, Mrs. Lev. amused herself much, and though not taking medicine, observed the hygienic and dietetic rules I had laid down for her guidance. Her husband's arrival was the occasion of a severe test of her recovery, as he was obliged to tell her that, during the early winter, one of her children had died. This news, gently imparted, provoked an outburst of passionate sorrow, but no relapse.

Another case in my private practice, illustrating the points I wish to lay before you, was that of Mr. M., aged 28 years, married, and a wine merchant by occupation. He had been a healthy and

temperate man, whose business, though prosperous, had pressed heavily upon him. From being a traveling salesman, he had become partner, and he felt the responsibility acutely.

During the winter of 1873-74, marked physical fatigue and slight chronic lowness of spirits manifested themselves. In February, 1874, Mr. M. slept less well, waking about early dawn and tossing uneasily about, until the hour of rising. In March, he became more depressed, ceased taking part in social games, needed spurring about everything, and began to speak of the bad way his business was in, and hinted at approaching ruin and beggary. In point of fact, this was the beginning of a delusion, as his affairs were in a fairly prosperous state. In April, after taking quinia pills, he began to speak about a stoppage in his bowels, and frequently remarked that he ought to die.

When I first saw Mr. M., in April, 1874, he was sitting in a chair, wearing a most melancholy expression, in strange contrast with his ruddy cheeks and general appearance of good health. He only half rose to greet me, and gave me a lifeless hand. He was in good flesh, his pulse strong, and not above 80. His tongue was much coated and his breath very foul. His frame of mind was that of despair, yet he was not emotional. "You can't do anything for me, doctor," he said. "My bowels are stopped and nothing will go through me; I shall choke with all the food they force me to take; my business is wholly ruined; we are beggars now; I can't go to business, I can't exert myself." He would put his hand on his abdomen and say, in the most despairing way: "There it is, doctor, you can't put anything through me." He had been sleeping less and less well of late, in spite of bromide of potassium, which had been given him by a friend, in considerable doses, for weeks. No hallucinations.

I made the diagnosis of melancholia with delusions, and informed the wife that success in treatment at home depended upon her vigilance, and our success in overcoming his objection to food.

In case he positively refused to eat, I should be in favor of his immediate transfer to an institution.

I administered croton oil pills, broken up in tea, with the result of giving him many free movements ; but the sight of the evacuations and our arguments did not dispel the delusion that his bowels were stopped up. He continued for weeks to entertain this notion, and to protest against being fed. He was like many insane persons, reasoning correctly upon a false premise. I was fearful that he might draw from his other belief, viz. : that he and his were beggars, the conclusion that it would be desirable and proper to kill his wife or himself. Consequently I enjoined upon his wife to remove from the room anything which might serve as an instrument of injury, to have the windows nailed fast, and to watch him incessantly. I directed that nutritious liquid food be given to him frequently ; beef tea, chicken broth, milk punch and egg-nog. In reality, he was supported chiefly upon milk and brandy, taking as much as eight and ten ounces of the latter per diem for two weeks and more ; when, as he began to eat more, the amount was lessened. The bromide of potassium was discontinued, and I prescribed chloral to be given, in case the stimulant did not make him sleep. I believe that few, if any, doses of chloral were necessary. As a tonic, and with the view of counteracting the depressing effects of the bromide of potassium which had been taken during so many weeks (no eruption produced), he was ordered :

R. Strychniæ, gr. j.

Acid. phosph. dil., ℥i.

Syr. aurant. cort., ℥iij.

M.

S. A teaspoonful three times a day.

Fortunately Mr. M., although protesting against being given food, which must accumulate and choke him, yet remained good-

natured, and made no physical opposition when his wife fed him and told him that it was the doctor's positive orders that he must eat. After a fortnight the refusal became less strong and gradually disappeared. He was taken out to walk once or twice a day, helped in dressing himself, and, when better, made to go down into the parlor and see friends. He often, during April and May, assured me that I would never be paid, as he was a Beggar, etc. After the 1st of June, the patient rapidly improved, sleeping and eating well, and using much less stimulus. On June 13th, I substituted for the strychnia mixture, the following :

R. Ext. nucis vom., gr. x.
Pulvis rhei,
Ext. cannabis, aa gr. xv.
Quiniæ sulph. 3ss.

M.

In pil., no. xxx., divid.

S. One before each meal.

About the middle of June, Mr. M. went to his father's place on Long Island, his wife accompanying him and watching him without his being aware of it. He worked about the house, bathed in the surf (never alone), and steadily improved. During the early part of July he referred to the locked state of his bowels for the last time. The last wrong notion to disappear was that about his business. In September and October he was well, only he feared to go to business because of mortified pride. He was afraid of remarks about his having been crazy. He had no more delusions, but his will was very feeble (it had never been strong), and it needed all his wife's exhortations, and my own words of cheer, to induce him to start life anew. He remembered all that had taken place, and was ashamed.

In these four cases, gentlemen, we find the chief symptoms of the melancholic state, or the condition of depression.

A. Psychic pain.—This element, difficult to define, was present in all the cases. It was indicated by words, and, better still, by the expression of the face, and the attitude of the body. The patient feels low-spirited, is without hope, the world appears as if a black pall had been thrown over it, friends are careless or have become enemies, everything goes wrong. This condition of the mind is one with which nearly all of us are acquainted in a milder degree, constituting what is popularly known as a “fit of the blues.” In many persons the “blues” amount to a short attack of melancholia with positive delusions, lasting one or two days. Satisfaction with the past, contentment with the present, and hope for the future, as well as all energy and power of enjoyment vanish when the fit begins. And, I believe, from the experience of my friends and from my own, that such attacks of transient melancholia are often the result of overwork or of mental strain. Some individuals will have such a fit quite surely after a month or two of hard professional work, just as another will close such a period by an attack of sick-head-ache. A day of desperate brooding succeeded by a night of unusually good sleep brings the attack to a close, and the subject awakes brighter and more energetic than he was for days before the storm; again, just as occurs after a sick-head-ache.

B. The negative state.—Whether from absorption in his mental wretchedness, or because of the influence of dominating or terrifying delusions, the patient shows no spontaneity in action; he fails to react normally (often does not react at all), to external stimuli or to the incitations which may arise within him as results of preserved intellection. A mode of expression of this negative state is the unwillingness of the patient to move, in his liking to sit or stand still in one position for minutes, or hours, or days. Many melancholic patients (while still preserving reasoning capacity) will never rise from the bed, or dress, or eat, or walk, unless made to do so by an impulse from without. This negative state

was present in cases I, III, and IV, and was faintly developed in case III.

C. Impairment of volition.—This was more or less marked in all the cases. In case II, the patient, while unable to overcome her depression and inertia, was yet able to control the frightful impulses to murder her children. Yet she felt that her feeble volition was not to be depended upon, and took the precautions to have some one with her all the time, and to lock up all cutting instruments. No one could say when the impulses might become irresistible. In many subjects, volition seems to be utterly absent (or unused) for positive purposes, for inciting to externally manifest acts, but appears excessively developed in a negative or opposing way, as in refusing food or objecting to taking exercise. In mild cases, no such obstinacy exists, and patients yield to positive commands with greater or less readiness.

D. Morbid impulses.—These were, I think, present in all the cases. The young lad whose case I first related, was led by these impulses to do many disagreeable things, whistling, crowing, stamping, kicking, etc. He was never aggressive or wicked, never stole or attempted to set fire to anything. Yet, I take it that he was a subject well-disposed to insane thieving or incendiarism (technically known as kleptomania and pyromania.) In case II, the impulses were constant and copious, and they were of a murderous type, tending to cause homicide. The patient's depressed mind was agonized by the dread that she might fail to resist the impulse. Suicide might logically have resulted from this condition, the patient having reasoning power left to prefer killing herself to injuring her children. In cases III, and IV, the morbid impulses were weak or concealed.

E. Hallucinations.—We understand by hallucination the occurrence of a false sensorial impression. The boy thought he saw thieves in a room, but there were none to see. A patient will hear voices, when there are none sounding, or will smell odors when

no one else can perceive them. Another patient will declare that certain sensations occur inside of him or upon his skin, when a careful examination shows no reason for believing that any such sensations can exist. I would remind you that a person can have hallucinations of any of the senses, and yet not be insane ; the difference in this respect between the sane and the insane, being that the mentally healthy mind corrects the false impression by the exercise of pure reasoning, or by means of tests applied by the other senses. For example, a person having an hallucination of sight (seeing an animal or a man) will make sure by the touch or by thinking that no one *can* be there. Again, one who has lost a limb by amputation, may have an hallucination of the sense of touch, leading him to believe that the amputated part is still attached, but he corrects the error at once, even though the impression be very vivid. The insane, on the contrary, accept the impression as true, and the hallucination then constitutes a delusion. Physiologically, an hallucination is to be looked upon as an outward projection of a deep-seated (in nervous centers) sensation or irritation : an irritation of the centers for sight being projected outward into the external world as images, etc. I might take this opportunity of remarking that prolonged and vivid hallucinations of hearing in the insane makes the prognosis more unfavorable.

F. Delusions. In my spring lectures upon insanity, I have proposed to classify delusions into sensorial and notional ; or, into those which consist in a firm belief in unreal objects, or sensations (connected with hallucinations), and those which consist in a belief in unfounded ideas. For example, in case I., the patient believed that thieves were in the room, and had a sensorial delusion which no amount of reasoning could dispel. In cases III, and IV, the false beliefs were psychologically different : in the one case, the patient believed that she could not recover, and in the second that he was ruined and that his family were beggared. Or, a subject will, in

melancholia, believe that he is damned, or, in general paralysis, that he is the father of fifty thousand children, eighteen thousand of whom are black, as in a case observed by my friend, Dr. Chas. H. Langdon, in the Hudson River State Hospital. In some cases, it may be difficult to draw the line between sensorial and notional delusions, on the one hand, and between notional delusions and eccentricity or peculiar belief, on the other hand.

G. Preservation of the mind, or of memory and the power of reasoning exists, in most cases of melancholia which are to get well. In our cases, this preservation was almost complete ; in only one case—case III—is diminution of memory noted. In all the cases, however, the reasoning powers were torpid or appeared so, because of the difficulty of observing their operation. It is common, however, for persons recovered from insanity to tell us that they had full use of their powers of observation and reasoning during their illness, but could not make this activity externally apparent. A knowledge of this condition will guide you in your relations with insane patients, leading you to use great kindness (though combined with firmness) and honesty toward them. I would have you know that a harsh word, a blow, a trick, or a satirical remark, will be remembered by nine patients out of ten.

I have occupied so much time in speaking of psychological symptoms that I cannot add much about the physical ones ; they are sufficiently detailed in the histories of the cases, and bespeak prostration of the nervous system, anæmia, and especially mal-nutrition of the brain.

As regards the importance of anæmia, as a pathological factor, in these and analogous cases, I would say that it is often overrated and wrongly stated. That general anæmia (spanæmia) should lead to impairment in the nutrition of all tissues, and of the brain in particular, I admit with every one. But that chronic diminution in the quantity of the whole mass of blood, shall lead

to the development of melancholia in a direct manner (*i. e.* by producing ischæmia of the brain), I consider extremely doubtful. In other words, I hold that rarely, if ever, is chronic anæmia a factor of as great importance as mal-nutrition of the anatomical elements of the brain; a mal-nutrition which may occur while the organ is receiving a normal quantity of normal blood, being brought about in such a case by excessive activity (waste) of the anatomical elements. I entertain analogous objections to the generally received idea, that congestion is frequently a leading pathological factor in cerebral diseases, and furnishes the chief indication for medication.

The ætiology of the cases is worth recapitulating, as in it we find indications for treatment. The first case I would separate in this connection, because it is anomalous in its manifestations, and probably many causes (paternal vice, insufficient food, and possibly the action of over-heat) co-operated to bring about the morbid state. Besides, I would not, even now, after months of observation, positively deny the epileptic origin of the oft-recurring attacks.

In cases II and III, types of a very numerous class, long-continued drain both upon nerve-power and upon the nutritive fluids (too frequent child-bearing, lactation, and excessive sexual indulgence) was the cause. In very many cases, the numerous factors (insufficient food and clothing, alcoholic and sexual excesses, thwarted desires, oppression, anxiety for daily bread, etc.), which go to make up the condition briefly called "misery" in the lower classes, often come into play. In case IV, we see the operation of a moral cause (so-called) upon a healthy, though rather feeble-minded individual. He could not stand the advancement and prosperity which his industry and faithfulness in a subordinate position had brought to him. Anxiety, of a purely imaginary kind, overpowered him.

Now, Gentlemen, about the management and treatment of such

cases. After you have made a diagnosis in a case of insanity, the first question, which will come up for consideration between you and the family of the patient, will be the momentous one : Shall the patient be treated at home, or shall he be sent to an asylum for the insane ? As upon the decision of this question may depend not only the life and reason of the patient, but also the existence of persons around him and the preservation of property, I think it worth while to give you all the aid in my power to lead you to a right decision. In the first place, be prepared for a protest on the part of the family against removal, and assertions that they will never consent to it, that it would kill the patient, etc., and do not let your judgment be influenced by such clamor ; the question is one not to be decided by considerations of sympathy and affection, but by reason and the light of experience. Three chief points should be studied in this connection: 1st. Are the hallucinations, delusions, and impulses of the patient vivid and strong? 2d. How obstinate is his refusal of food? 3d. How distinct is the tendency to suicide? I am speaking only of cases of melancholia, please remember.

If hallucinations and delusions are strongly marked, the other two states will most probably also be largely developed. The refusal of food, when positive, obliges us to feed patients by means of the stomach-pump, a procedure almost impossible in private practice, as the operation should only be done by a medical man. If the suicidal tendency is strongly developed (if the patient fancies that a celestial voice bids him kill himself to avoid damnation), the watching at home will not be sufficient to prevent the accomplishment of the wish. Patients will wait months for an opportunity to throw themselves out of the window, or to drown themselves. My rule is in such a state to declare that the patient must be placed in an asylum, or that I can have nothing further to do with the case. I can hardly conceive of arrangements which could induce me to take charge of a severe case of melancholia confined

in a private house (except in the late, incurable stage in which dementia is present). Another reason for advising the removal of the patient to an asylum, or separating him from his relatives, is when he connects most of his melancholic delusions with the members of the family, or when their presence appears to plunge him in the slough of despair and psychic pain. Besides the considerations named above, there is one which has great weight with the relatives of patients, viz. : that the chances of recovery are much increased by early removal to an asylum.

If the symptoms enumerated above are not strongly marked, if, in other words, the case is one of mild melancholia, you may, I think, properly undertake to treat it at home.

By what means ? In the first place, by kind, firm, and judicious management as described in the cases related in the first part of the lecture. Instruct the relatives and nurses to watch incessantly, to prevent the accomplishment of a concealed plan of suicide. I would have you feel that every depressed patient *may* commit self-destruction. The minutiae of this watching and care I cannot enter into ; they will readily occur to you. Secure a cheerful moral atmosphere for the patient as far as possible ; make him eat, go to walk ; engage in simple games, pay some attention to social duties. You may use an authoritative tone and manner toward him without failing to be kind and considerate. Let your positiveness be his helpful stay ; let your will replace his own which is so feeble.

Many such patients will need "building up," which means the giving of a more nutritious food in larger quantities, together with the extra foods, alcohol and oil. This "building up" would, of course, be in vain, if you did not look after every possible source of drain upon vitality, lactation, menorrhagia, uterine disease, repeated child-bearing, sexual excesses legitimate and solitary, and put a stop to the one you find active.

As aids to improve nutrition and strength you have a choice among many tonic medicines, including some of the class "restor-

atives" of Headland, such as hypophosphite of lime and soda, free phosphorus,* iron, manganese, arsenic, strychnia, alcohol.

In order to produce sleep, I would advise you to use either chloral or opium. The bromide of potassium is generally prescribed, but without much good effect. We do not know that it is a direct hypnotic, and the quietude which its continued (days or weeks) use brings about, is accompanied, I am convinced, by malnutrition of the cerebral tissue. Thus, while it may for a time do apparent good, by preventing restlessness, it injures the patient by perpetuating a condition of the brain, which many believe to be fundamental in the melancholic state. The use of chloral, if not too long continued, is better, and less injurious. We can produce quiet certainly by this drug, and most patients can take it long without showing symptoms of chloral poisoning.

Opium, cannabis indica, and alcohol often make melancholic patients sleep very well; and, besides, they improve the nutrition of the brain, render the circulation in it more active, and thus expedite *cure*. These drugs belong to the classes narcotics and delirians of Headland: they first, when given in proper doses, produce intoxication, and then depression and sleep. To all of the patients, about whom I have talked to you, I gave alcohol, in some shape or other, porter, milk-punch, etc. All but one took opium and cannabis. These medicines I give in pillular form, pushing the opium up to the point of slight narcosis (which is difficult to

* Free phosphorus may be given in ethereal, alcoholic, or oily solution. One of the best (and my favorite) modes is by Thompson's solution of phosphorus. (The Practitioner, 1873, II, p. 13, p. 271) the formula for which is as follows:

Phosphorus gr. vi.

Absolute alcohol ℥xxx.

Dissolve and add.

Glycerin ℥ix.

Acidol ℥iiss.

Mix the two solutions and, while hot, add essence of peppermint ℥ss.

℥i of this solution contains between $\frac{1}{9}$ and $\frac{1}{10}$ gr. of phosphorus.

It may be given as it is, or with more glycerin, or with cod-liver oil.

produce in these cases), and seldom giving more than a grain and a half of cannabis in the twenty-four hours. Or, as has been practised lately in France, with great success, morphia may be given hypodermically twice a day in gradually increasing doses. This plan, in private practice, is open to the objection that the physician must make too frequent visits.

Galvanization of the spinal cord, and of the cervical sympathetic has been used in Europe and in this country, in the treatment of melancholia, with apparent success. It is important to apply the current continuously (*i. e.* without shocks), in order to obtain a good effect. For particulars of the methods recommended, I refer you to Althaus, Medical Electricity, London, 1873, p. 483.

There are many other points in the treatment of mild cases of melancholia at home, which I have not time to dwell upon, such as the regulation of the action of the bowels, spunging with cold water, or the use of cold compresses, the choice and gradation of occupation and amusement, each day, etc. Your common sense, and medical knowledge, together with a knowledge of the patient's habits, will guide you safely in these matters. I have the greatest faith in the efficacy of amusement and employment in the treatment of insanity in general, and of melancholia more particularly. Reading aloud to the patient, inducing him to play some simple games, backgammon, dominoes, croquet, billiards, taking him to places of interest, and, when convalescent, to minstrels or theatre. All these things will be of service. For women, knitting, sewing, the care of a room, will be proper occupations at home. There comes a time, in convalescence, when travel is a most valuable remedial means, involving, as it does, change of climate, variety of food, exercise, pleasant sights, and association with strangers. In the moral treatment we must aim to displace the painful, depressing ideas which surge in the patient's mind, and try to break up the chain of association between morbid physical conditions and unhealthy mental states.

I would close by warning you that you will need to exercise much patience in the successful management of such cases, that you should make the family understand that the treatment will last months, and that, if you are not faithfully and actively aided by the patient's friends or by nurses in the carrying out the moral treatment, your medication will prove quite useless.

SOME FORMS OF DYSPEPSIA,

BY

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GENTLEMEN :—We see during every year at the College Clinique, a considerable number of patients suffering from dyspepsia. In other words, they are patients suffering from a number of unpleasant symptoms, and these symptoms are due to the fact that their food is not properly digested.

In treating these patients, we can sometimes determine which of the viscera concerned in the digestive process is in fault. You know that the digestion and absorption of our food is effected by the physiological action of the stomach, the small and large intestine, and the liver. You will find, in practice, that you can distinguish cases of dyspepsia dependent upon diseased function of the stomach, others due to the condition of the small intestine, others to that of the large intestine, others to that of the liver. Of the pancreas, our knowledge does not enable us to speak.

It is not by any means always, however, that you can make the diagnosis of stomach dyspepsia, intestinal dyspepsia, liver dyspepsia, as the case may be; you will find some patients in whom none of the viscera act normally, and other patients in whom the symptoms do not enable you to locate the disease.

After excluding all these cases, however, you will still find many persons in whom only one of the digestive organs is at fault.

Now let us see what are the characteristic symptoms of the different anatomical varieties of dyspepsia, and first, what are the symptoms of dyspepsia dependent on an abnormal state of the stomach.

The symptoms are nausea and vomiting, pain, loss of appetite, eructations of gas and of sour fluid.

The nausea and vomiting follow the ingestion of food, and seem to be directly due to the presence of the food. There may be only slight nausea after each meal, or every meal may be followed by vomiting. Both the nausea and vomiting may follow every meal, or they may select some part of the day—morning, noon, or evening—and only occur after the meal taken at that time. In some patients, such a condition of nausea and vomiting will continue for years. The vomited matters consist only of food, or of food mixed with a sour fluid ; of this, the patient may vomit several quarts during each attack.

The pain also follows eating : it varies from a mere feeling of oppression to the most intense agony. The pain, like the vomiting, seems to be due to the presence of food in the stomach, and is usually relieved if the stomach is emptied. The pain is regularly followed by a desire to vomit, and after this is done the pain ceases. A fragment of bread not larger than a chestnut, remaining in the stomach, is sometimes sufficient to keep up the pain and retching for hours, until it is expelled. The appetite is usually small, capricious, and unnatural. The patients often dread to take food on account of the pain and vomiting which they know will follow. In the older cases, there are frequent eructations of gas from the stomach. These may be so frequent and noisy as to be a serious annoyance. If the stomach be dilated, as is sometimes the case, this can be distinguished by percussion and palpation.

If the disease is of long standing and severe, the patients lose flesh and strength, and present a very deplorable appearance.

The lesions consist in a chronic inflammation of the mucous coat of the stomach, with a loss of power in the muscular coat. The inner surface of the organ is constantly coated with an increased quantity of tenacious mucus. The connective tissue between the gastric tubules is increased in amount, and the tubules themselves become atrophied. The stomach is sometimes found very small, in other cases much dilated.

The milder cases of the disease can often be cured by regulating the diet and life of the patient, without much resort to medical treatment. The severer cases are only temporarily benefited by such means.

The patient whom you see to-day is an example of the more severe form of stomach dyspepsia. She is an Irish servant girl, 40 years old. About two years ago she began to have pain and vomiting after her meals. After nine weeks these symptoms ceased, and she enjoyed tolerable health until eight months ago. At that time, she again began to vomit about fifteen minutes after eating. At the same time, there was a dull boring pain in the epigastric region and extending into the back. She has never vomited blood. The pain and vomiting continued; she became much emaciated, and was so feeble as to remain in bed much of the time. Her appetite continued to be good; her bowels were somewhat constipated. I saw her for the first time five months after the commencement of her illness. She was then very feeble and emaciated. She had been put under a variety of medical treatment and had been kept on milk diet for some time, but without relief. The pain and vomiting would cease for a few hours or a few days, and then return.

In the epigastric region was a globular tumor, tympanitic on percussion, which I supposed to be the dilated stomach. At that time, three months ago, I stopped all drugs and washed out her stomach with the stomach-pump every day. This treatment was

continued, with occasional intermissions, for two months. The pain and vomiting became less frequent, and then ceased entirely. She has steadily recovered her strength and flesh, and is now able to work. For the past month the pumping has been discontinued, and her health has continued good.

As a companion to this case, let me read you the history of a gentleman who has been under my care for a considerable length of time. He is a man 45 years old, by occupation a broker. About sixteen years ago he began to have attacks of pain and discomfort in the epigastric region, lasting several days, and ending in an attack of vomiting. These attacks occurred about once in four weeks. At that time his habits were irregular. His food was often eaten hastily, he worked hard during the day, used stimulants pretty freely, and frequently ate late dinners and suppers. In this condition he continued until about six years ago. At that time the attacks of pain and vomiting gradually became more frequent, were more readily excited by indiscretions in diet, and left the patient feeble and prostrated for several days. Any preparation of alcohol was almost certain to bring on one of these attacks. From time to time he consulted different physicians, and followed out several plans of treatment. On several occasions he became so much better as to think himself cured, but, sooner or later, the old symptoms always returned. The attacks of pain and vomiting gradually became more and more frequent, until they occurred almost every day. The pain was always the most distressing symptom, and the patient would often voluntarily excite vomiting in order to relieve the distress.

Finally, he was placed on a milk diet. This diet he carried out strictly for six months. For the first four months the attacks of pain and vomiting ceased, but, after that time, again recurred.

In the summer of 1874 he came under my care. I commenced to wash out his stomach with the pump, at first, every other day,

and then every day. He soon learned to use the instrument himself, and has continued to use it up to the present time. He eats all the ordinary articles of diet, has gained much in flesh and strength, and with ordinary prudence in diet, could easily give up the pump altogether. But, as he finds he can always prevent the bad effects of improper food, he is apt to take good dinners and suppers as he pleases, and pump himself out afterwards.

These two cases, Gentlemen, will give you an idea of what I mean by dyspepsia confined to the stomach.

You will observe that in both cases we have the same set of symptoms—attacks of pain and vomiting, coming on, first at long, and then at short intervals. The attacks always excited by the ingestion of food, and the pain ceasing when the stomach is emptied. The disease lasting for years, and growing steadily worse. Medical treatment alleviating the symptoms for longer or shorter intervals, but never permanently.

For these cases, Gentlemen, I believe the most rational and effectual treatment to be the systematic use of the stomach-pump.

The cause of the attacks seems always to be the presence of undigested food in the stomach. The longer the disease lasts, the less tolerant does the stomach become of any such substance, until, at last, every day there is an attack of pain and vomiting.

Why the stomach should become so irritable and intolerant of the presence of food, I do not know. Autopsies of such cases show only the lesions of chronic gastritis.

The vomiting, in these cases, seems to be the effort made by nature to effect a cure. By the use of the stomach-pump we do the same thing, but much more easily and effectually.

Any pattern of stomach-pump will answer the purpose. It is more convenient to use one which holds about ten ounces. The œsophageal tube should be as large as can be easily introduced, and the holes at its end should be as large as possible. The best

tubes are the English. They should be thoroughly softened in warm water before they are introduced. After the patient has become accustomed to the procedure, a piece of soft rubber tubing makes the best tube.

In introducing the tube, the patient should sit in a chair with the head upright—not thrown back. You will find that there are two points where the tube is sometimes grasped pretty firmly by muscular contraction—the lower part of the pharynx, and the œsophagus—just before it enters the stomach. Steady, but very gentle pressure usually overcomes this resistance very readily. In some patients, however, you will have to begin with a very small tube, until they become accustomed to it.

After the tube is introduced, you throw in about six ounces of tepid water, and then reverse the syringe, and draw out all the fluid that will come. Then again you reverse the pump and throw in water, and then again draw it out. This process you continue until the water comes out perfectly clear, and without any fragments of food. Adult stomachs will usually hold about twenty-five ounces of water; more than this gives distress.

The best time for washing out is the hour at which the patient has been accustomed to have his attacks of vomiting. If these attacks have occurred daily, the washing out should be done daily. After a short time, you can readily teach the patient to introduce the tube and manage the pump himself; after that, he can carry out the treatment at home, using the pump less and less frequently, as his health improves. At the commencement of the treatment, the patient should take for breakfast and tea nothing but milk, for dinner, mutton chops and baked potatoes. As he improves, you increase his solid food until he eats all the ordinary articles of diet. The rule is not to use the pump until three hours after a meal of solid food, in order that the stomach-tube may not be obstructed by large fragments.

Now let us consider those cases in which the symptoms are due to functional derangement of the small intestine, the stomach being unaffected.

In these patients the symptom which is apt to be the most troublesome is pain. This pain may be referred to any part of the abdominal cavity. It is usually described as a constant dull pain, not like that of colic. It has no special relation to the ingestion of food or to its quality. It occurs when the stomach is full or empty; whether the food is spare and simple, or abundant and rich. The use of liquor will usually stop it for a short time. There may be some particular time of the day at which the pain comes on with tolerable regularity; very often this will be late in the afternoon.

There may be nausea, but not vomiting. The nausea does not follow eating, but is apt to occur in the morning.

The appetite often remains good. Food is taken with relish and causes no distress.

The bowels may continue to act with perfect regularity. Flatulence is a common, but not a constant symptom.

The patients are up and about, and able to attend to their business, but they feel languid and good for nothing. Sometimes they become much alarmed about themselves, and imagine that they are suffering from cancer or some other serious disease.

Not infrequently persons have several attacks of this condition, at intervals of several months. The earlier attacks only last a few days, the later attacks are more severe, and may last weeks and months.

Some of the cases are very easily relieved by treatment, others prove very obstinate.

The drugs usually indicated are cubebs, ipecac, and asafoetida. Cubebs may be given in the form of powder or of tincture. Ten grains of the powder, or twenty minims of the tincture is

the usual dose, to be given three or four times a day. Ipecac is given at first in small doses—one-eighth of a grain—and then increased gradually up to one to four grains, three times a day. Asafoetida may be given in four-grain sugar-coated pills, or in the shape of the compound Galbanum pill.

Riding on horseback is often of very great service ; walking, on the other hand, does not seem to be of as much benefit. Traveling for several months from place to place may effect a cure, when all other remedies fail.

I am unable to show you any case illustrating this variety of dyspepsia. It is rare among clinique and hospital patients, although in private practice it is sufficiently common.

Dyspeptic symptoms dependent upon disordered function of the liver are very common. The great majority of cases of dyspepsia coming to this clinique are cases of liver dyspepsia, either alone or combined with disorders of the other digestive organs.

In this variety of indigestion the symptoms are very variable, and often very intractable to treatment.

Physiologists teach us that the liver performs several important functions. These functions are very well summed up by Murchison as follows :

1st.—The formation of glycogen, which contributes to the maintenance of animal heat and to the nutrition of the blood and tissues, and the development of white blood corpuscles.

2d.—The destructive metamorphosis of albuminoid matter, and the formation of urea and other nitrogenous products, which are subsequently eliminated by the kidneys ; these chemical changes also contributing to the development of animal heat.

3d.—The secretion of bile, the greater part of which is re-absorbed, assisting in the assimilation of fat and peptones, and probably in those chemical changes which go on in the liver and portal circulation ; while part is excrementitious, and, in passing

along the bowels, stimulates peristalsis and arrests decomposition.

It is not easy in any given case to say which of these functions of the liver is disordered and gives rise to the existing symptoms. I have found it convenient, however, clinically, to divide these patients into two classes, according to their general condition. In the first class I include those of florid complexion, and with well-developed adipose and muscular tissues. In the second class I include those of pallid complexion, spare figure, and feeble muscles.

It has seemed to me that in the first class the symptoms are due to the derangement of those functions of the liver which should effect the destructive metamorphosis of albuminoid substances, so that the patients receive a full supply of the nutritious portions of the food, but do not get rid of the excrementitious.

In the second class of cases, on the other hand, there is no failure of these destructive and excretory functions, but those functions which should effect the assimilation of fat and peptones are disordered so that the patient is imperfectly nourished.

In the one case, the tissues are over-manured, but badly drained; in the other, they are well enough drained, but not manured at all.

I will show you first an example of the second class.

This man is thirty years old, a policeman by occupation. He tells us that his health has been good until within the last year. During this time he has gradually lost flesh, strength, and color. His appetite is sometimes good, sometimes not; occasionally there is slight nausea in the morning. He has a dull, uncomfortable feeling in the head much of the time. There is a dull pain in the right hypochondriac region. His bowels are constipated. During the year he has consumed a large quantity of medicine at different times. His urine is normal, except for an increased amount of oxalate of lime.

You may see that his face is thin, pale, and anxious. He is very

much alarmed about himself. This man's condition I believe to be due to the fact that his liver does not properly perform its functions of excreting bile. This is felt in two ways. There is insufficient assimilation of fat and peptones, and the large intestine does not feel the natural stimulus of the excrementitious bile.

Some of the patients belonging to this class are much troubled with flatulence.

Headache is a very common symptom and often very distressing. Curious nervous feelings in different parts of the body are often complained of. The patients say that the top of their heads feel like ice, or that they have cold chills down the back or limbs, or pricking sensations in the skin, or a feeling of constriction about the body. Very often they are much troubled by sleeplessness. They are very apt to be much disturbed about their own condition, and even to become very hypochondriacal.

There may be irregular action of the heart and pain in the precordial region. There is also often dull pain in the right hypochondriac region, which may extend into the back and shoulder.

The bowels are usually constipated. The patients lose flesh and strength. The urine is normal, or contains an increased amount of oxalate of lime, or sometimes stellate crystals of phosphate of lime.

This condition is often very intractable to treatment, and always requires continuous and systematic care.

The diet is to be carefully regulated, but should be full and nutritious. Wines, ales, and spirits are often of service. Cream and even cod-liver oil are sometimes indicated.

To relieve the constipation, strychnia, aloes, sulphate of magnesia, rhubarb, and podophyllin answer a good purpose. Bromide of potash, asafoetida, and guarana are of service in allaying the nervous symptoms and restlessness. To improve the appetite and act as a tonic nothing is better than the mineral acids.

Exercise in the open air is to be insisted upon, and, in young persons, bathing the entire body, every day, with cold water.

The general principle which you bear in mind in treating these cases is that their symptoms depend on the failure of the liver to perform its share in the process of digestion, and as a result of this, the fact that the entire body is insufficiently nourished.

You must also remember that the various pains and uncomfortable feelings from which these patients suffer give rise to many errors of diagnosis. Congestion of the brain, paraplegia, uterine disease, heart disease, pulmonary phthisis, are all ascribed, not so very infrequently, to patients suffering from liver dyspepsia alone.

In the first class of cases of abnormal liver function, the appearance of the patients differs widely from that of the patients of whom we have just been speaking. These patients are stout and well-developed, often of rosy, florid appearance. They are usually persons who live well, drink, and use tobacco freely. They may even be in the habit of taking a good deal of exercise.

In spite of their healthy appearance, however, we find the same depression of spirits and tendency to hypochondriasis. They are less liable to headache, but more so to attacks of vertigo. These attacks of vertigo may be so severe that they fall to the ground and lose consciousness.

The appetite is usually good. The bowels are sometimes constipated, sometimes regular. There is often an occasional diarrhoea from very slight causes. The urine is very apt to contain an excess of uric acid or of the urates.

In many cases, the first symptoms of which complaint is made are the vertigo and the uncomfortable feeling about the head, sometimes also an inability to apply the mind to business, and a partial loss of memory.

These patients sometimes discover that a brisk purgative makes them feel much better for several days, and they become regular

customers of the venders of the different kinds of purgative pills.

One of the first requisites for successful treatment is an entire abstinence from every kind of alcoholic drink. No wine, beer, or spirits should be allowed, not even in small quantities. Tobacco is equally pernicious in these cases; it should be absolutely prohibited.

These patients require, not merely ordinary out-of-door exercise, such as walking and riding, but often pretty violent muscular exercise, such as is afforded by the gymnasium.

They are often much benefited by the natural alkaline and sulphur waters.

As regards drugs, there is no general plan of treatment that can be laid down, but in each case you endeavor to meet the special indications, trusting for a cure to the general hygienic management of the case.

The principal symptom of dyspepsia due to the condition of the large intestine, is constipation. This symptom is common to all the varieties of dyspepsia, and occurs also with various other morbid conditions. At the present time, however, I wish to call your attention to a class of cases in which the condition of the large intestine is the sole cause of the patient's symptoms, and in which this condition causes not only constipation, but other symptoms of indigestion.

This condition of the large intestine occurs in old people. It seems to be due either to a loss of power in the muscular coat of the intestine, or to a loss of sensibility in the mucous coat.

In the milder cases the condition is not constant, but occurs from time to time. The patient fails to have an operation of the bowels for several days. He feels dull, languid, loses his appetite, has headache, is troubled with flatulence and uncomfortable feelings in the abdomen, which may even amount to colic. After

a few days there is a slight diarrhœa. These passages are small, painful, do not give a feeling of relief. The patient is, at the same time, very much prostrated, vomits his food, and may even take to his bed. If you are called to attend these patients after the diarrhœa has begun, it is very important that you should recognize the true nature of the case. The administration of any preparation of opium, or of any drug which merely checks the diarrhœa, only does harm and prolongs the sufferings of the patient. A mild laxative, on the other hand, will very promptly relieve all the symptoms. The ordinary dinner pill is one of the best preparations for this purpose.

In the more severe cases the symptoms come on gradually. The patient is at first only a little constipated; the bowels move every few days, either of themselves, or with an enema, or with some laxative. And yet, during this time, the large intestine is not really emptied, but there is a constant accumulation of feces in the rectum. The constipation becomes gradually more pronounced, and the patient finds that enemata and mild laxatives no longer give him a movement. Then he may use more active purgatives, which produce a number of fluid stools and yet do not empty the large intestine of the hardened feces, which are still accumulating. So the patient goes on, from bad to worse, alternating between constipation and diarrhœa, always uncomfortable, often with very severe pain in the abdomen, losing strength rapidly. If the condition is not relieved, an old person may be so reduced in this way as to die without any other disease than constipation.

The first point in the treatment is to introduce your finger into the rectum and ascertain whether or not it is filled with hardened feces. If it is, the feces must be scooped out with the finger or some convenient instrument, and then the rectum should be washed out repeatedly until it is entirely emptied.

After this the patient must be constantly watched and examined,

from time to time, to ascertain that the feces are not accumulating again. The diet must be regulated, and aloes and strychnine may be employed to assist the action of the large intestine.

I have endeavored thus to sketch out roughly for you some of the cases of dyspepsia in which only one of the digestive viscera is involved. I think that in your future practice you will be able to recognize some of these cases when you see them, and I think it will add much to your satisfaction in the treatment of all cases of dyspepsia, if you make the attempt to analyze the mass of symptoms, and assign them to the different viscera to which they belong.

DIAGNOSIS OF THOSE DISEASES OF THE EYE WHICH
CAN BE SEEN WITHOUT THE OPHTHALMOSCOPE.

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FAMILIARITY with the normal appearance and functions of the eye is obviously an essential prerequisite for understanding its diseased state. I shall therefore introduce the subject of the diagnosis of externally visible diseases of the eye by a description of how the healthy organ appears to a critical observer, and of the proper method of examining it and testing its functions. It is almost needless to remark that there are considerable differences in the minute features of the eye, according to the age and the individuality of the person. These minor diversities will be suitably mentioned.

A. The proper way to inspect an eye is as follows : The patient should be placed facing the light, when his eyes are being objectively examined, and be put with the light behind him, when the subjective or functional examination is being made. Let us begin with THE OBJECTIVE EXAMINATION.

Eyelids. The eyelids should be free from redness, swelling, irregularity, secretion, ulceration, crusts, or tumor. They should easily open so as to bring into view the whole cornea, except about one line of the upper border, and be capable of separation

more widely than this. They should close completely, without special effort, or tremor, or spasm. They will be lax and full in some persons, in others short and smooth. In old persons the Cilia.

skin will be wrinkled more than in the young. The eyelashes should be regular, not disposed to turn inward, not covered with secretion, or ova, or insects. They should be thickly set together and be in at least two or three rows.

Lachrymal apparatus. The lachrymal puncta should be distinctly visible, directed against the eyeball, not pouting, nor reddened, nor everted. Over the lachrymal sac there should be no tumefaction, or tenderness, or redness. The tendo oculi should be easily recognized, and pressure upon the sac with the tip of the finger should not cause any fluid to escape from the lachrymal puncta. The caruncle should have a very pale pink color and be free from swelling or morbid growth. While the surface of the eyeball should be moist, there should be no brimming of tears over the edge of the lower lid.

Inner surface of lower lid. On pulling down the lower lid so as to show its inner surface, the conjunctiva should be of a pinkish color with vessels coursing over it, but smooth, delicate and free from nodules, or outgrowths of the surface.

Inner surface of upper lid. To evert the upper lid, the thumb or forefinger of the left hand should be placed lightly with its tip against the middle of the lid, and press gently downward, while the fingers of the same hand rest on the forehead. The patient is directed to look downward, and when this is done the border of the lid is taken in the thumb and forefinger of the other hand, and bent over the thumb as a fulcrum. The lid must not be pulled away from the globe, but the manœuvre must be the same as to bend a card with one hand, over the thumb of the other, placed at its middle, when it is lying on a table.

Facility in executing this turn of the lid is a most important

acquisition. I prefer the above method to the use of a probe or pencil as the fulcrum, because the thumb has a control in steadying both eyeball and lid. If there be much spasm or swelling, or great secretion, eversion will be easier by covering the thumb of the right hand with a soft rag, and with it pushing the edge of the lid over the other thumb. To examine the lids of infants, place them with the head upon your knees as they lie on the back, while the mother supports the body on her lap. Use the forefinger of the left hand to press down the brow and upper lid, while the fingers of the other, or its thumb, bend the lid over. A bit of rag or towel over the tip of the right thumb will be of great help to get a hold upon the yielding and often wet tissues. The conjunctival surface should appear of a very light pink tint, shading into yellow; the vertical lines of the meibomian follicles should be visible, the regular concavity of the fibro-cartilage should appear. At the extremities of the everted lid the conjunctiva will be more vascular. The whole surface should be perfectly smooth. Oftentimes the extreme upper limit of the conjunctiva can be exposed to view as the eye turns strongly downward. The superior fold of reflection will show a certain fullness and be dotted over by minute solid glandules imbedded in the tissue; sometimes at the outer angle the orifices of the ducts of the lachrymal gland may be seen. On the superior fornix conjunctivæ, there will not be any papillary or gelatinous-looking elevations or outgrowths.

Eyeball.

Next observe the appearance of the eyeball. On the white of the eye there will be seen very few vessels, and these will be isolated twigs, which are the continuations of vessels which have supplied the muscles. In later life there will be more vessels visible than in young persons, and the color of the globe is then yellowish and opaque, while in young people it is bluish white, transparent and lustrous. The vessels belong to the conjunctiva,

and may be seen to dip into the interior of the eye at a point about two or three lines from the border of the cornea. On the *Pinguecula*. horizontal meridian, about midway between the border of the cornea and the caruncle, a small, whitish yellow nodule is often found, especially after middle life, which is composed of fat and connective tissue, and called *pinguecula*. It is a deposit in the sub-conjunctival connective tissue, and never to be dignified as a morbid product.

Cornea. The cornea has in adults a diameter of 12 millimeters ; it may exceed or fall below this limit in rare cases. It is circular, though liable to be slightly oval, the least diameter being vertical. The border is never sharply defined and sometimes is quite difficult of accurate designation. It is called the *limbus corneæ*. Sometimes the sclera and conjunctiva encroach to quite an extent upon the tissue of the cornea. Just within the *limbus*, and separated from it by a narrow portion of transparent substance, is often to be seen a grayish arc, which occupies more or less of the upper part of the cornea, and in some cases extends *Arcus senilis*. around its whole circumference and is known as the *arcus senilis*. This does not usually appear until after middle life, and is a process of fatty metamorphosis. With the exception of this change the cornea should be transparent. It should reflect from its surface a bright, clear, reduced image of the window, which should not undergo distortion on whatever part of the cornea it may fall. The customary way of making the examination of the smoothness of the corneal surface is to cause the eye to look at the examiner's finger as it is held up and moved about in various ways. The bright picture of the window should not grow blurred or broken or confused over any part of the cornea—only as it approaches the extreme border the image will always be a little less bright and will be to some degree elongated, because at its periphery the cornea does not have precisely the same degree

of curve as at its central part. Should there be on any spot an ulcer, or facet, or minute opacity, the image of the window here will not be perfect. Another and important mode of ^{Oblique or focal illumination.} examining the transparency, both of the epithelial surface and of the substance of the cornea, is by condensing light upon it by means of a convex lens of two inches focus. This may be done by daylight or by artificial light. It is the most searching method of detecting irregularities and opacities. They will become conspicuous by contrast with the normal tissue, and if at the same time the observer view the cornea through another convex lens of two and a half or three inches focus, it will be hardly possible for any morbid condition to escape discovery. It must be remarked, that when a strong light is thus condensed upon the cornea, a considerable amount is always reflected back from its tissue, and more from the senile than from the youthful cornea; this simply indicates that the structure has a minute degree of opacity which serves to render it visible. The cornea should also be viewed in profile, whereby any notable increase of convexity would be seen, as happens in cases of so-called conical cornea. The sensibility of the surface of the cornea should be tested by touching it lightly with a shred of paper. The healthy eye quickly shrinks from such contact, while certain morbid conditions produce complete or partial indifference to it.

^{Anterior cham-ber.} The next thing to be observed is the aqueous humor, iris and pupil. The aqueous humor should be so transparent as to present nothing to attract attention. The space it fills, viz., the anterior chamber, should have a depth of three to four millimeters at the middle. The actual depth of this space is fully four millimeters, but refraction of light makes it seem more shallow. Should there be any variations from this apparent size attention must be given to the cause. A diminution in the depth of the anterior chamber may be due to adhesion of the iris

to the cornea (anterior synechia), to a fistulous opening in the cornea which permits leakage of the aqueous humor ; the anterior chamber is shallow in cases of chronic glaucoma and of swelling of the crystalline lens, and of incipient cataract, traumatic or spontaneous. The anterior chamber is deep, in serous iritis, in cases of cyst of the iris, in dislocation of the lens forward when the lens is absent, or much shrunken.

Iris. The iris varies in color at different periods of life and in different individuals. It may be parti-colored, and one eye may be in strong contrast with its fellow. Whatever its hue or markings, it should have a lustrous surface, due to an epithelium, and fibers should be seen in distinct relief. Immediately around the pupil they are circular, and over the outer portions of the membrane they are radiating. Seen under a two-inch lens they often appear wavy. The edge of the pupil shows a black tint caused by the coming to view of the dark pigment which covers the posterior surface of the iris. The general plane of the iris is slightly convex, and this is most evident as one approaches the pupil.

Pupil. The pupil is a circular aperture, piercing the iris a trifle nearer its nasal side than its temporal. It is never for any long time of uniform size, but changes with the degree of light, with the movements of the globe, with the adjustment to distance, and in obedience to influences from the brain and sympathetic system. One pupil should be precisely like the other in size, and should be absolutely in accord with its movements. The diameter of the pupil natural to the individual is subject to considerable variation, the quickness of its action diminishes in later life, and its size is in old persons habitually small. Sluggishness of action, persistent contraction or enlargement, and the quickness of its response to the instillation of sulphate of atropia, are all points to command attention. Sometimes the only way of cer-

tainly ascertaining the existence of adhesions of the pupil to the crystalline lens (posterior synechia) is by resorting to atropia.

The color of the pupil up to middle life is jet black, and one seems to be peering into a profundity of darkness, not merely looking at a black surface. In advanced life the pupil no longer has a pure black color, but becomes dusky or smoky, and this effect is made more conspicuous by condensing light upon it with a lens. The reason for this appearance lies in the diminished transparency of the crystalline in later life, and sometimes this is so notable that one would be led to think there must be a cataract. It is highly important to remember this fact in examining the eyes of old persons. In case there is a cataract the color of the pupil will be that of the cataract and vary with its peculiarities.

Vitreous chamber. Beyond the crystalline lens, it is usually not possible for the unassisted eye of the observer to penetrate. Nevertheless, certain forms of deep-seated disease do betray themselves by the appearances to be seen through the pupil. Such are intra-ocular tumors which give a yellow, or red, or whitish reflex. Some cases of detached retina are thus faintly visible; a dislocated cataract may sometimes bob up into sight, and vitreous opacities can sometimes be indistinctly discovered.

Tension of globe. The resistance which the eye offers to the finger is a point always to be noted. The normal degree of tension is variable, and there is no instrument for measurement which has come into general use. The educated sense of touch is the best means to be relied on. There should be a slight and almost insignificant yielding of the globe under gentle pressure, which is manifestly due to the fact that the globe is not filled to the utmost degree. Should the contents of the eye be increased so as to stretch the sclera, there will be hardness to the touch or increased tension. Should the contents of the eye be abated, the tension is diminished. Both increase and decrease of tension

are morbid conditions. Furthermore, the eye should not be sensitive to pretty firm pressure.

Margin of orbit. Neither should the patient wince if the finger be passed firmly over the edge of the orbit and make special pressure over the supra-orbital notch. It is usually not possible by such a digital exploration to feel the lachrymal gland. The tip of the finger can be buried pretty deeply between globe and orbit, especially below the eye.

Situation in orbit. The situation of the eye in the orbit is to be noted ; one globe should not advance beyond the other. In case of exophthalmos the degree can be measured by laying a rule across the root of the nose and measuring with the lids closed. If both eyeballs protrude, note whether the upper lids come forward or stretch, to a corresponding degree, so as to cover the corneæ, or whether they seem to be too scanty or to be retracted, thereby leaving the upper edge of the cornea and more or less of the adjacent sclera exposed. In the latter case look for enlargement of the thyroid gland and think of Basedow's disease (exophthalmic goiter.) If one eye push forward while the other have a normal position, there is some local morbid condition in the orbit. Observe how the movements of the globe may be affected, and whether in its displacement it be pushed forward in the axis of the orbit. In this condition a careful digital exploration and auscultation over the globe and upon the temple are important, and an inspection of the nares should never be neglected. If the tumor pulsate, the effect of pressure on one or both carotids should be observed.

To complete the objective examination the next step in order is exploration of the eye by the ophthalmoscope, but the limits of this lecture do not contemplate the discussion of this subject.

THE SUBJECTIVE OR FUNCTIONAL EXAMINATION comprises the following parts: 1st. The acuity of direct vision. The state of

refraction must often be examined in this connection, but this subject is not to be considered in the present discussion. It would greatly enlarge the limits of the lecture. It is, however, never to be omitted when acuity of vision is imperfect. 2d, The accommodation to near objects. 3d, The field of vision. 4th, Capacity of recognizing color. 5th, Control of the muscles.

Acuity of vision. 1st, The acuity of vision is measured by the standard which has been universally accepted from Snellen, which assumes that the average degree of sight is when the retina easily sees letters which form upon it an image which subtends an angle of five minutes ($5'$), and is made of lines whose thickness forms an angle of one minute ($1'$). The test types, as they are called, are numbered from CC to XX and still finer, the numbers given to them indicating the distance at which they ought to be read. The correct mode of stating the degree of vision is to put the finding in the form of a fraction, whose numerator is the distance at which the type is seen, and the denominator the number belonging to the type. Thus normal vision is when type XX is read at twenty feet and is thus expressed: $V = \frac{20}{xx}$.

If at twenty feet only type No. XL can be read $V = \frac{20}{xl}$.

If at twenty feet only type No. C can be read $V = \frac{20}{c}$ or $\frac{1}{16}$.

This standard of vision is not exacting.

Many persons can read No. XV, and not a few No. XII at twenty feet, giving respectively

$$V = \frac{20}{xv} \text{ and}$$

$$V = \frac{20}{xii}$$

A marked difference will be observed to depend on the brightness of the light. It will not be fair to expect the results of an

examination in a very clear sun to hold good for a cloudy or stormy day.

Accommodation
for near ob-
jects. 2d, The accommodation to near objects is that faculty which the eye possesses of increasing its refractive power so that when an object approaches, the image of it is made to fall accurately upon the retina. The means by which this augmentation of refractive power is obtained, is the increase of the crystalline lens in curvature and thickness, under the action of the ciliary muscle. The degree to which this shall be possible depends not only on the contractility of the muscle, but in a more important degree upon the pliability of the lens. The more elastic the lens, the more considerable will be its capability of becoming convex. In youth the substance of the lens is most soft, and at this period the faculty of accommodation is greatest. In other words, the eye is then able to read print at the closest distance. According to the determinations of Donders, a person at twelve years of age can read the fine type of Snellen, known as No. 1, at 2 2-3 inches. At twenty-five years the utmost limit of his endeavor is reached in reading the same at four inches. At forty-five years the maximum effort is at eight inches. At sixty it is at twenty-four inches. It is noted, therefore, that the power of accommodation begins to abate from early life, and that after the age of forty-five the abatement has reached a point which makes the seeing of ordinary type at the common distance decidedly laborious. Because it is impossible for any muscle to be kept for a long time upon the full measure of its contractile force. The ciliary muscle is not able to exert continuously much more than half its maximum power. Hence, at about the age of forty-five, when the near point of comfortable vision has retired to sixteen inches (1.8 divided by $2 = \frac{1}{16}$), it will soon happen that for fine print or by poor light, or in protracted work, reading becomes laborious or print indistinct. This is the time when the accommodation has so

far failed as to give to the condition of the eye the name of presbyopia.

Field of vision. 3d, After examining the visual qualities of the central part of the retina, which comes into play in all acts of direct vision, it is needful to inquire into the sensitiveness of the eccentric parts of the retina—in other words, to determine the limits of the field of vision and ascertain whether there are in it any spaces of diminished sensibility (scotomata). This is done after a very simple manner, by placing the patient before a black-board, near the center of which is a mark for him to look at with one eye, the other being closed. The distance from the board should be twelve or sixteen inches. While his gaze is steadfastly fixed on the mark, a bit of chalk on the end of a rod is moved about the edges of the board, and the extreme points at which the chalk is visible are marked. This is done for all parts of the field, and the successive dots joined by a line which gives the boundary of the field. The shape of the normal field is a figure of irregular form, its breadth greater than its height, and the point of fixation is much nearer the nasal than the temporal side—because the nose is a barrier to vision. The depth of the eye in the orbit, the bushiness of the eyebrows, and the prominence of the orbital margins, all affect the extent of the field. Besides ascertaining **Scotomata.** the boundary of the field, it is important to discover whether there are obscure or blind spaces in it in addition to the normal blind spot of Mariotte, which corresponds to the extent and situation of the optic nerve. A more accurate way of making this examination is by means of an instrument called a perimeter, and the result of the finding is recorded upon a diagram prepared for the purpose.

Perception of color. 4th, The power of recognizing colors has in some cases an important meaning. It is needful of course to be informed if there be any original defect of this kind, of

which the most common kind is inability to recognize red. The loss of color perception takes place most often in atrophy of the optic nerve, or in disease of the brain. When careful measurements are taken of the extent of field in the normal eye for the respective colors, it is found that green can be recognized over the smallest area, then follow red, orange, purple, violet, yellow and blue, which means that the most eccentric parts of the retina can recognize blue, while they cannot discern green.

Muscular power. 5th, Finally the action of the muscles is to be noted. If, in any position which the eyes may be made to take, double vision can be detected, this will be of grave import. The method of doing this is to put a bit of red glass before one eye, and use a lighted candle as the object, which is to be carried into various positions far up and down, to the right and left, as well as in front of the patient. In addition to this test the power of the muscles is to be exercised by means of prisms. They furnish a measure not of the absolute lifting power, but of the predominance of certain muscles over their antagonists. They give for instance the utmost degree of convergence or of divergence for a distant object, and employed upon a near object they, with the angle up or down, make known what position the visual axes would take if left to the natural inclination of the muscles. The strongest muscles are the recti interni, and if they do not have a predominance over the recti externi, of at least five to one, it is likely the person will suffer. It should be easy for a patient to make a convergence, when an object is twenty feet distant, which overcomes prisms of 25° or more, and a divergence which overcomes prisms of 5° to 7° . If a prism be put before one eye with its base up or down, whereby vertical diplopia ensues, the two images should stand perpendicularly to each other, whether the object be at twenty feet or at one foot distance. Any failure of the equilibrium, whether in the way of divergence or of convergence, indicates an unnatural state of the muscles.

B. We will pass now to a consideration of the diagnosis of the diseases of the eye. The morbid process, which is by far the most common, is inflammation. It may affect one tissue, or several tissues of the eye at once; only a part of one tissue may be concerned, and the intensity of the action will be extremely various. The most important suggestion to be made at the outset is that one must not be led to depend chiefly upon the variations or characteristics of the *hyperæmia* in ascertaining what parts of the eye are inflamed, but look to the changes which have occurred in the *texture and functions of the tissues* to tell the story of the site of the inflammation. The vascular system of the eye is capable of subdivision into parts in some degree distinct, but they are interdependent so far that hyperæmia of one tissue will excite hyperæmia of another, and the mere engorgement of vessels does not constitute inflammation.

Blood-vessels. The circulation in the conjunctiva is in great measure distinct from the system of vessels going to the iris, ciliary body and cornea, and known as the anterior ciliary vessels. Yet they freely communicate, and both will be to some extent affected when one of these tissues is inflamed. The implication of several tissues at the same time in an inflammatory action will be recognized, not by the extension of hyperæmia to the vessels which nourish the several parts, but by the discovery of alterations of function and texture in the several parts. Only in observance of this rule can absurdities and mistakes in diagnosis be avoided. It is very common in all severe inflammations of the eye to have the lids swollen, sometimes to an extreme degree, but this does not justify the declaration that in suppurative choroiditis there is also blepharitis; nor the same diagnosis in case of a wound of the globe, because the lids are puffy.

One must distinguish what is the essential morbid feature from those phenomena which are merely incidental or successive.

Eyelids. THE EYELIDS may become diseased in any of their component parts — the skin, the connective tissue, the hair follicles, the meibomian follicles, the muscles, the lining membrane or conjunctiva, the fibro-cartilage, and the blood-vessels — or, as a whole, from wounds and burns, and congenital defects.

So far as the *skin may be diseased* it is only needful to enumerate its various affections without attempting a special description. We have acute inflammation in erysipelas, in eczema, in herpes ; we have chronic conditions in warts, in horny growths, in yellowish patches of fatty deposit at the inner parts of the upper lids called xanthelasma palpebrarum.

The *connective tissue* may become inflamed and infiltrated with serum, giving rise to a swelling which may be pallid and painless and unattended by any other trouble of the eye, or there may be an abscess either diffused through the lid or concentrated, as a furuncle, about one of the follicles at the free border. In all these conditions the features of acute inflammation will be sufficiently apparent, and it is only needful to be sure that no other lesion shall occasion or accompany the lid trouble. We also have chancre, and tertiary syphilitic ulcerations, syphilitic eruptions, cancerous ulcerations, lupus. Epithelial cancer is quite common and deserves description. It has usually begun as a scale or scab of a drab or brownish color which, when picked off, exposed an abrasion which, when carefully felt, could be pinched up as a stiff, wafer-like thickening. It goes on slowly without irritation or pain. The more advanced conditions show a thickened bit of skin which can be lifted up between the fingers like a disk of cartilage, the surface often puckered or lobulated, the cutis thin and shiny, exhibiting often a few prominent vessels ; an ulceration or scab may be upon it, and the common seat of the disease is the vicinity of the lid-border.

After a time deeper ulceration takes place, and the preauricular lymphatic gland becomes enlarged.

Hair follicles. Affections of the hair follicles arise from ulceration and thickening of the border of the lid, which cause the hairs to drop out or become misdirected, or they turn awry by alterations induced in the fibro-cartilage consequent upon chronic inflammation of the conjunctiva. The hairs also fall out because of the

Lice. effects of syphilis in alopecia. Upon the cilia, *lice* (*pediculi pubis*) sometimes find lodgment and propagate. Their eggs may be seen adhering to the shafts of the hairs and resemble strings of fine beads. A magnifying lens will easily detect the form and movements of the animals.

Cysts. A frequent deformity upon the lids is the occurrence of cystic tumors which arise from obstructions of the meibomian follicles. They may be single or multiple. They are recognized by being beneath the skin, imbedded in the tarsal cartilages, by their smooth, rounded form, by their slow and painless progress, although they often originate in a slight furuncular inflammation of the lid-border. On reversing the lid, a reddened patch will commonly be found upon the conjunctiva, and the wall of the cyst may be evidently very thin, or there may be a nodule of granulation tissue upon it. These tumors vary in size from a hemp-seed or a pea to a chestnut. When small the skin above them is loose and movable, not tender; in advanced conditions the skin becomes adherent, red, and tender.

Solid tumors sometimes occur in the lids and are not easily distinguished from the cysts, nor is it of any special moment to make the distinction.

Muscular affections. The muscular disturbances of the lids are spasm of the orbicularis which happens as one of the elements of chorea, or as a local trouble in the affection called "tic." Paralysis of the orbicularis makes it impossible to perfectly close

the lids, and takes place in some, but not in all the cases, of paralysis of the facial nerve.

Paralysis of the levator palpebræ superioris makes the lifting of the lid imperfect, and compels the patient to use extra efforts with the occipito-frontalis to pull up the skin of the forehead and brow, so as to act indirectly on the lid. At the same time the head is thrown backward. While this depends on paralysis of the third nerve, it may happen without accompaniment of any other of the nerve twigs, or it may be only one of the several features of third nerve paralysis.

Encaethus. An inability to lift the upper lids also exists as a congenital defect of structure, and is symmetrical on both sides. There is also deficient development of the palpebral slit, and the inner canthus is usually not well shapen. The muscle is probably wanting. These cases present such striking appearances that they could not be overlooked. They are called by the name of encaethus. This peculiar conformation is often hereditary. The eyelids have the form characteristic of the Chinese, but in most exaggerated degree.

General pathology of textures of exterior of eye. We will now pass in review the general features which characterize the inflammations of the several parts of the front of the eyeball, viz., the conjunctiva, the cornea, the sclera, and the iris. What we are to look for in each of these tissues is *alteration of texture* and *suspension of function*. In the case of each tissue we must ask what is its function and what its normal texture.

Conjunctiva. THE CONJUNCTIVA.—Its texture is delicate, thin, semi-transparent, and surface smooth and moist; its function is that of a serous membrane to permit two surfaces to glide over each other without friction. When inflamed the membrane becomes swollen, infiltrated; the surface loses polish, becomes rough; by effusion it is lifted above the subjacent parts, and

by hypertrophy becomes thickened, especially the palpebral portions ; further, the scanty and translucent fluid, which is the proper secretion, becomes augmented in quantity, and transformed to a muco-purulent, or purulent, or plastic material which sticks to the lashes, fills the eye and flows over the lids, or adheres to the surface of the membrane. In fact, this abnormal secretion is the conspicuous feature of a common conjunctivitis. The abundance of it is in proportion to the severity of the process. It consists of altered epithelium, pus cells, and neoplastic cells, with serum and plasma. In every case of conjunctivitis this material must occur at some period, and in more or less quantity.

Cornea.

THE CORNEA.—It must be transparent like glass, and be shaped to a special curvature, otherwise its function, as a lens, cannot be performed. In all cases, when inflamed, the transparency is impaired, or its substance eroded, or both occur. Opacity in some part of the tissue will be the unfailing sign of keratitis. This may be in the epithelium, in the substance of the cornea, or on the posterior layer. It may be small in extent and well defined, be in one spot or many spots, or be pretty equally diffused. The opacity may be so dense as to be glaring, or it may be delicate and require close inspection by a condensing lens and magnifying glass, or exploration by the mirror of the ophthalmoscope. This statement is true of the early period of inflammation and also of the later stages when repair is going on. In the reparative period blood-vessels appear in the cornea, which are, of course, opaque, and the new tissue, which is to build up structure after ulceration, is always at first opaque.

Irregular refraction of light may be stated to be the invariable consequence of inflammation of the cornea. This is verified in all forms of ulceration—even in the so-called transparent ulcers which mark a protracted or asthenic state of disease. The fact is

most easily discovered by the mirror of the ophthalmoscope, but may be discerned by noting whether the *reflection* of light from the surface is perfectly regular. Let the light of the window fall on the eye, and note whether the picture of the window is reflected with sharpness and regularity from all parts of the cornea, as the eye moves slowly about in various directions.

Change of form occurs as the issue of serious destruction of the corneal substance, because the softened or attenuated or perforated membrane yields to the pressure of the contents of the globe and the muscular forces, and may give rise to conspicuous deformity. It must also be observed that change of form, so-called conical cornea, takes place without inflammatory action. In the most severe forms of keratitis, the cornea perishes by suppuration, and is reduced to a soft, yellow, opaque mass. The above statement as to inaccuracy in refraction of light is true of all cases of keratitis.

Iris. THE IRIS—in texture—consists of pigment, blood-vessels, muscular fibres, epithelium, nerves, and connective tissue, etc., etc. The visible surface presents lines, dots, fibers, making a web whose threads can be seen in relief as described before. The function is to exclude light from entering the eye except by the pupil, and to vary the size of the pupil according to conditions of light and the needs of the accommodation. When inflamed, the tissue of the iris becomes infiltrated, hence swollen and blurred. The luster of the surface disappears, the markings become dim and indistinct. The pupil loses its clear, jet color, and acquires a smoky or muddy hue. In the case of a negro, the iris may be of so deep a brown that alterations of color and surface will be very difficult to discover. By close inspection, a certain “fluffiness” may be seen in the inflamed iris of the darkest negro. Attend next to the action of the pupil. If iritis exist, the pupil will refuse to dilate when the eye is shaded. Let the eye be covered by

the hand, and quickly exposed, and the pupil will not respond. To make the matter more certain, try whether the physiological effect of sulphate of atropia can be produced. A solution, two grains to the ounce, should produce large circular dilation in from fifteen to thirty minutes. If iritis exist the pupil will either refuse to enlarge, or its expansion will be irregular, and the form will be determined by the number and extent of adhesions to the lens. In iritis the pupil is always small, because the effusion into the membrane obliges it in swelling to press toward the vacancy which the pupil offers. Again, the activity of all the muscular fibers is impaired, just as the movements of the arm are restrained by erysipelas of the limb, or a boil in the axilla. The variations which may occur in the appearances of iritis according to the nature of the inflammatory effusions will be subsequently mentioned.

Sclera. THE SCLERA has only the functions of a containing membrane, and is dense and opaque white. It does not, when inflamed, exhibit much swelling, while in some circumscribed forms of scleritis this can be observed. Often when inflammation has passed away, or been oft repeated, the tissue becomes thin in spots, and permits the dark color of the ciliary body and choroid to shine through. In acute scleritis, the diagnosis is reached more by exclusion than by positive characteristics. There will be hyperæmia, but without the secretion and thickening of conjunctivitis, without the opacity of the cornea—unless both cornea and sclera are inflamed—without the blur of the iris and inactivity of the pupil of iritis; and when all these negative facts are definitely made out, one may be justified in deciding upon the presence of scleritis; one must in this case also scrutinize the character of the hyperæmic vessels: their fineness and depth in the tissue, and their light, pinkish color will help the judgment. Finally, this form of inflammation is vastly less frequent than the others, and its improbability will have weight in the mind of the observer.

Symptoms common to above diseases.

It may now be well to call attention to certain facts which are common to the above diseases. In case the action is intense, there will be in each instance swelling of the lids—which in severe conjunctivitis will be extreme—there will be intolerance of light—which is greatest in cases of keratitis—there will be hyperæmia, and the kind of vascularity will be varied to some extent by the tissue concerned; there will also be pain, which will be in proportion to the activity of the disease. In the case of iritis there will be impairment of sight, and usually this will be true of keratitis. In conjunctivitis and scleritis there will be very little abatement of sight.

Varieties of inflammation.

Another matter to be mentioned is that in all these diseases there are various phases of inflammation as well as differences in intensity.

Varieties of conjunctivitis.

CONJUNCTIVITIS is subdivided into catarrhal, purulent, diphtheritic, and phlyctenular. The first three names only express the fact that with varying intensity the inflammatory product is more mucous, or purulent, or plastic. The accessory phenomena of inflammation such as swelling, infiltration, redness, pain, etc., etc., will vary in proportion to the intensity of the action, and the order named is in the succession of increasing severity. But phlyctenular conjunctivitis means an eruption of one or more small foci of inflammation, usually near the cornea or on its edge, which appear as spots of redness, with thickening of the conjunctiva and subconjunctival tissue, and on whose summit ulceration soon occurs. They will be more or less painful as they penetrate more or less deeply into the scleral tissue, or as they encroach more or less upon the cornea. In young subjects with excitable, nervous structures they are attended with more irritation than in adults. Most commonly they do not cause serious irritation.

The reason why they are sometimes excessively painful and

cause extreme photophobia has been shown by anatomical examinations (Iwanoff) to depend on the fact that the cells which make up the nodule are found making their way to the surface along a nerve twig ; the irritation of this twig readily explains the symptoms.

One of these nodules of inflammation may extend over a surface the size of a three-cent piece, and involve the subconjunctival tissue so as to produce a decided thickening. There will then be more muco-purulent secretion than is common in phlyctenula, and the case will shade into episcleritis.

Episcleritis. A form of chronic inflammation which occasionally occurs in the subconjunctival tissue, and often at the limbus corneæ, deserves mention. There is thickening of the conjunctiva and the sub-mucous tissue, without ulceration or muco-purulent secretion ; a limited spot only is affected, and it may form a flattened, pyramidal mass. It is apt, if at the edge of the cornea, to shade into opacity of the latter structure, and in extreme cases may involve it to a serious extent. The congested vessels are those of the deeper tissues, there will be some prominent trunks which will be tortuous, and, by standing out upon a nearly normal white surface, become specially conspicuous ; these are commonly veins running from the inflammatory nodule, and at the site of the thickening the congestion is of a paler hue than belongs to phlyctenula, consisting of fine vessels of the sclera. This condition of disease does resemble phlyctenula, but varies from it in the prolonged duration, in the more highly organized thickening, in the absence of secretion and of photophobia, and in the dull, persistent pain which belongs to it. It is known as episcleritis.

Granular lids. An extremely common lesion of the conjunctiva is the thickened and roughened state which mostly affects the palpebral portion, and is known as granular lids. The phases which it exhibits are too numerous for detailed description. The stage of

the disease and the intrinsic nature of the process combine to make each case a picture by itself. The cases, as they usually appear, have had more or less inflammatory thickening of the membrane, and this constitutes its conspicuous traits. But the beginning of the disease consists in the formation of a grayish or yellowish or translucent, jelly-like material in the substance of the conjunctiva. It may exist in small granules the size of rape or hemp seeds, or the little masses may coalesce into patches. This formation may remain quiescent for months, and the eye be hardly conscious of its presence. But inflammation is very likely to attack the membrane, the above material rapidly increases, and the usual products and processes of inflammation supervene. The inflammation may come with violent symptoms, or gradually ; by whichever method it approaches, the conjunctiva becomes swollen and hypertrophied and roughened.

Varieties of
granular lids.

There are the following separate conditions which belong to trachoma, or granular conjunctiva :

- 1st. The period of trachomatous infiltration without inflammatory symptoms.
- 2d. Acute inflammatory trachoma, in which acute inflammation has supervened upon the pre-existent trachoma deposit.
- 3d. Chronic inflammatory trachoma, in which the tissues are thickened through the combined agency of trachoma deposit and inflammatory products.
- 4th. The state of absorption, deformity, and atrophy.

Simple tra-
choma.

1st. The simple trachomatous deposit without inflammation excites so little irritation that it is not often exhibited to the physician. It is found mostly in the folds of reflection above and below, and at the outer angle of the lids. Sometimes and rarely it appears on the ocular conjunctiva. This substance is merely an augmentation of the lymph follicles which

are normal to the conjunctiva, and on minute examination it is found to have precisely the same characteristics ; hence it might properly be called adenoid tissue, because it consists of the same substance as do the lymphatic glands. The differences in its appearance depend upon the density of the mass and on the secondary changes which it has undergone. It varies in transparency and color, but has the look of jelly or boiled tapioca.

Acute inflammatory trachoma. 2d. Acute trachoma would commonly be regarded as an ordinary conjunctivitis of some severity, but there are certain differences. There is great swelling of the lids, and of the ocular conjunctiva, often chemosis is considerable, there is great pain, heat, scalding, and photophobia—but the secretion is small in proportion to the swelling and violence of symptoms. The secretion is rather watery than muco-purulent, is not thick and yellowish, but glairy, and only a little sticky. If the lids can be everted, the conjunctiva will be covered with small papillæ and nodules half buried beneath the surface. The amount of hyperæmia of the conjunctiva is extreme, and the skin of the lids is dusky red ; often the epithelium of the cornea is abraded. There will be much heat, stiffness and pain, with profuse lachrymation.

Chronic trachoma. 3d. Trachoma with chronic inflammation is the frequent form of granular lids. While the whole of the palpebral membrane is thickened, that in the culs-de-sac is often fungoid in its degree of growth. The inflammatory products and hyperæmia are often so dense as to conceal the usual trachoma masses. At one period the tissue will be soft and succulent, later it will have hardened and become more cartilaginous in quality. During this transformation the fibro-cartilage is often deformed—being bent inward so as to show a furrow on the under surface—and the whole lid is shortened in length. By this con-

traction in all directions, as well as by the fretting of the rough surface, the cornea loses the luster of its epithelium, becomes covered at its upper portion by minute ulcers, and penetrated by new formed blood-vessels. As this process advances, the vascularity and opacity increase until it becomes dense enough to merit the name of pannus. At this time the lids cannot be widely opened, the sight is obscured, and there is much photophobia and lachrymation. There is also considerable mucous secretion.

Chronic tra-
choma in
late stages. 4th. After a prolonged continuance of hypertrophy, the stage of atrophy ensues. The conjunctiva is not now covered with prominences, but becomes smooth and glazed. In it white lines of cicatricial tissue appear. It shrinks in all directions, and the whole lid becomes contracted. Often the eyelashes are distorted and turn, either a few or all of them, upon the cornea. In the ultimate stages of this condition the mucous membrane loses its lubricating properties, by conversion into dense connective tissue and thickening of the epithelium, until it assumes the appearance of skin or of the border of the lids. The folds of reflection become obliterated, and make a kind of symblepharon. At the same time the cornea will have become densely opaque.

After the above description it would seem easy to recognize trachoma. A caution must be interposed not to designate cases of simple conjunctival hyperæmia by this name. In them there often is a little prominence of papillæ at the ends of the lids, when the ocular sides are exposed, but this chronic congestion is very different from granular lids.

Palpebral con-
junctivitis. Palpebral conjunctivitis, or, better named, palpebral congestion, is a common affection, and is either idiopathic or symptomatic. When not dependent on any other morbid state it has little significance, but is, in fact, often merely a conspicuous incident in some more serious

trouble. The subjective symptoms directly dependent on it may be the only ones which the patient announces, but inquiry must be pushed in several directions before the case is fully investigated. Congestion of the palpebral conjunctiva is a manifestation of strain of the eye, or it is the extension of inflammation of the nasal mucous membrane. When symptomatic of difficulty of sight, the causes to be looked for are : 1st, errors of refraction, such as hypermetropia, astigmatism, beginning or advancing myopia ; 2d, overworked accommodation independent of structural errors of refraction ; 3d, incipient cataract ; 4th, fatigue of the muscles. Besides these ocular causes, the importance of examining the nasal cavities must be strongly asserted. When catarrh of the lachrymal passage exists, the palpebral conjunctiva is always congested, but the same condition occurs when there is no disturbance of function of the lachrymal tubes, while the Schneiderian membrane is inflamed. Simple palpebral congestion is also liable to occur in old persons as an evidence of atony of tissues, and it will be far from easy to completely cure. In debilitated persons of any age, particularly in women having uterine disease, it is very common. In the last stages of exhausting or fatal disease it sometimes creates an extreme degree of annoyance. The local sensations are of sand in the eye, of scratching, of heat, of weakness, of shrinking from use of the eyes, of tightness of the lids, of dryness ; sometimes there is excess of moisture ; sometimes *muscæ volitantes* appear, or temporary obscurations occur. When these complaints are heard after looking at the everted lids, enter upon the inquiries above indicated as to refraction, accommodation, degree of sight, nasal cavities, and general health.

Pterygium. The surface of the cornea may be covered by a semi-transparent and vascular tissue which grows upon it as a production from the neighboring conjunctiva. It has a general triangular form, with the base toward the conjunctiva, and, from its ob-

vious resemblance to the wing of an insect, it has been called pterygium. It appears most commonly on the inner side of the cornea. It may be so small as barely to overstep the margin, or it may reach to the center of the cornea. Sometimes there may be more than one upon the eye; usually each cornea is symmetrically provided; sometimes the growth is formed upon some other than the horizontal meridian. The nature of this growth is easily recognized by noticing its distinct membraniform character—that it is superjacent to the cornea, while adhering to it. The union to the cornea is most intimate at the apex. As the eye is rolled about, the membrane is made tense or lax according to the direction of the movement. The vessels which appear in it are continuous with those of the conjunctiva. The membrane can be picked up in a fold with a pair of forceps. If dissected off, a bleeding and denuded surface is left on the cornea. This membrane forms very slowly, advances toward the center of the cornea, occurs mostly after middle life, is accompanied often by chronic conjunctivitis, and only interferes with sight when it has reached the vicinity of the pupil.

Sequels of
keratitis.

It is now proper to call attention to certain conditions of the cornea which are the permanent effect of disease.

1st. The cornea has been perforated either by wound or ulceration, and into the aperture the iris has penetrated and become fastened. This constitutes *anterior synechia*. There is upon the cornea a white opacity, and if the destruction of tissue has been large, there will be at its center often a black spot where the adherent iris shines through. The cornea may be visibly protuberant, or may appear to preserve its normal curve. The pupil will be displaced toward and usually partially concealed by, the scar. Sometimes it will be wholly concealed by, and included in it. When the eye is viewed in profile, the iris will

Anterior syne-
chia.

be seen to advance toward, and touch the cornea, and the same fact can, after a little experience, be recognized in a front view of the eye.

**Fistula of
cornea.**

In case the place of perforation has been at the center of the cornea, and been small, a permanent orifice will sometimes remain for months or weeks, and as it drains away the aqueous humor, will wholly obliterate the anterior chamber, and render the eyeball soft to the touch. This consti-

**Anterior polar
cataract.**

tutes a fistula of the cornea. During the continuance of the flow, the crystalline lies against the cornea ; a bond of attachment may form between the two surfaces, and after the corneal opening shall close, and the aqueous chamber retain its fluid, the lens will be pushed back to its place, and the exudation which united the surfaces may tear away completely from one of them, or it may be stretched out into a fine thread which will be easily discovered. At any rate, there will be a small white speck on the center of the lens and another on the cornea to indicate the fact of the contact and adhesion of the surfaces. This is the etiology of *anterior polar cataract*.

**Staphyloma of
cornea.**

In case a large part of the cornea has been destroyed by ulceration, as the new tissue forms, it yields to the pressure of the contents of the eye, and bulging forward, develops *staphyloma of the cornea*. The shape of the protuberance varies from a slight cone to a large bulbous or globular outgrowth. It sometimes grows to be so large as to be incapable of being covered by the lids.

In cases of total destruction of the cornea, the whole iris may be laid bare or covered with a layer of new tissue so thin as to exhibit an irregular black surface, upon which are projections separated from each other by bands of connective tissue. The impression made by a casual glance at such a case might be that this was a melanotic sarcoma, but a knowledge of the history, and the fact that the eyeball is in reality reduced in size, would dispel that

idea. At a later period the black color grows more gray as the tissue increases in thickness. Sometimes the crystalline lens is exposed and presents itself on the surface. It may either escape by rupture of its capsule, or be covered up by new tissue growing from the cornea and iris.

Cyst of iris. Another condition which may ensue from perforation of the cornea and anterior synechia is that the adherent iris becomes transformed into a cyst. Such a result is very infrequent, and would be recognized by a careful inspection in front and in profile, with condensed light, and aided by a magnifying glass. When such growths reach a moderate size, attacks of irritation and inflammation occur which assume more or less of the glaucomatous character. The cyst pushes back the iris and crystalline, making a very deep anterior chamber. The increased depth is not uniform, but is greatest at the side of the cyst. It will also be possible to see the outline of the cyst more or less perfectly, unless it have monopolized the whole chamber. There will be a peculiar decolorization of the iris occupied by the cyst as compared with the remaining part. A condition of Diffused slight opacity. cornea liable to be overlooked is a very faint degree of opacity diffused over the whole surface or confined to the region of the pupil. The mode of discovering this is by the condensing lens and magnifying lens together, by the mirror of the ophthalmoscope, and by testing the degree of sight.

Descemitis. Likewise the posterior surface of the cornea becomes dotted over with minute brown or black specks, as fine as flour emery, in consequence of proliferation of the epithelium of the posterior elastic lamina, and by precipitation of granules from the muddy aqueous humor. This is an occasional complication of iritis or of inflammation of the ciliary body and choroid. The specks would easily escape the naked eye, and are most abundant, at the lower portion of the cornea. They remain for a long time

and necessarily injure sight. The inflammation is often called by the uncouth name of *Descemetis*. This affection is by no means very rare.

Conical cor-
nea.

Conical cornea is not the consequence of inflammation, but the mechanical effect of attenuation or atrophy of the cornea. It stretches and becomes misshapen, because of the pressure of the contents of the globe upon its weakened structure. The early periods of conicity will exhibit the objective phenomena of irregular astigmatism, viz., diminished sight and astigmatism partially corrected by spherico-cylindric glasses. As the deformity develops, it will become apparent to the naked eye. There will be a notably brilliant reflex from the cornea—the image of a window will be seen to be small when reflected from the middle, and to be both larger and distorted when reflected from the marginal portion. The anterior chamber will be unusually deep, and when viewed in profile the cornea will be unduly projecting. Often, under profile inspection, the apex will have a dark hue because of total reflection of light, and it may seem as if a drop of water were resting on the summit. This optical effect will readily attract attention, and be correctly appreciated by looking at the cornea from different angles. Another striking optical effect is seen when one examines with the mirror of the ophthalmoscope. Illuminating the eye from the distance of ten to twenty inches, there will be a spot, or curve, or band of darkness playing around the center of the cornea, as the mirror is tipped at slightly different angles. There will always be pain and fatigue in the eye, besides imperfect sight. It is usual to say that these eyes are always myopic, but I have seen cases which were best corrected by convex cylinders. Sometimes a decided opacity appears at the top of the cone, while in all advanced cases some opaque spots will be seen.

In speaking of granular lids, the frequent occurrence of vas-

Pannus of cornea with irido-cyclitis. cularity of the cornea was mentioned, and its direct dependence upon the irritation of the roughened eyelids pointed out. There is another and more deplorable condition of pannus of the cornea, which does not depend on hypertrophy of the palpebral conjunctiva, but is associated with chronic inflammation of all the anterior textures of the globe. The whole anterior zone of the sclera and conjunctiva are injected with vessels, while the cornea is so thickly covered with red vessels as to leave no transparent tissue. The vessels are most dense at the margin, are equally thick-set around the whole circumference, and so far obscure the limbus as to make it impossible to define with precision the corneal border. At the middle of the cornea there is a diffused gray opacity, with a little abatement of vascularity. There is photophobia and copious lachrymation, pain is not severe but constant. Nothing can be seen of the iris, the ciliary region may be tender on pressure, the tension of the globe is apt to be diminished. The subjects of this disease are usually anæmic and feeble; they may be scrofulous or syphilitic. Their constitutional dyscrasia is often hereditary. The diagnosis of concomitant inflammation of the iris and ciliary body is founded upon the intense and general hyperæmia of the eyeball, the sensitiveness of the ciliary region, the alterations in the hydrostatics of the globe, and the changes which will be found in the iris and interior of the eye after the disappearance of the pannus, in case this happy change should occur. These cases are very discouraging, because they maintain a sullen indifference to all treatment. Torpidly and obstinately they continue unchanged for weeks and months.

Similar but less severe cases. A class of cases less severe, but similar, are those in which a fringe of vessels will occupy the border of the cornea for the width of two or three millimeters, and extend over a part of its circumference. There will be some opacity beyond the region of vascularity, but much of the cornea will be

clear. The special character of the vascularity is that the vessels are fine, closely set together, are of equal length, as if they had been cut off with scissors, and at once suggest the red fringe on a shawl. On close inspection they will be seen to belong not only to the surface, but to the depth of the corneal substance. There will always be hyperæmia of the adjacent ciliary region, with tenderness and sometimes staphyloma. In sensitive persons there will be acute pain, and impairment of sight always exists. These cases are obstinate, but will succumb to careful treatment. Sometimes an iridectomy must be made.

**Ciliary hyper-
æmia.**

The ciliary vessels of the sclera may become congested without the development of iritis or cyclitis ; although hyperæmia of these tissues may, and probably does, exist. This may be only the first step toward inflammation, which may advance no further, or it may come from undue exercise of the ciliary muscle in efforts of accommodation. From whatever cause it arises, the external and only sign will be the faint pinkish hue of the sclera near the cornea, and this, on minute inspection, will be seen to consist of the deep and fine vessels of the sclera which supply ciliary body, iris, etc. There will be no thickening of tissue, no oedema, no secretion, and the congestion will surround the whole cornea. It usually will soon subside when the cause is discovered and removed. To do this requires an examination of the optical condition of the eye, of the amount of labor exacted of the organ, and the assurance, by use of atropia, that iritis or cyclitis is not impending.

**Sequelæ of
iritis.**

The visible sequelæ of iritis are not so many and various as those of keratitis, but a few remarks will be in place. If there have been abundant masses of exudation (condylomata), the tissue of the iris will undergo atrophy at the place where the exudation appeared, and besides being ad-

herent to the lens, will show a spot of decided discoloration; it will show the fibers of the tissue plainly and be manifestly thinned. Sometimes, by the mirror, the light can be thrown directly through such a spot.

Distension of
posterior
chamber.

If the whole of the pupillary edge has adhered to the lens, a curious condition sometimes is at length produced. Because of the irritation of the iris and ciliary body, an accumulation of fluid forms between the iris and lens, which cannot get access to the anterior chamber, and therefore bulges out the iris as if it were a ring-cushion or a circlet of flattened cysts. The peripheral part is pressed forward to contact with the cornea, and the membrane undergoes atrophy. The plane of the iris is made to resemble the surface of the top of an apple, the pit where the stem belongs corresponding to the retracted pupil. This state of things eventuates in disease and, perhaps, destruction of the deeper parts of the eye. There will usually be some anomalies in the external circulation, in distended and prominent veins, and the eye may become tense and painful.

Cyclitis.

The ciliary body rarely becomes the primary seat of inflammation, though it frequently participates in the inflammations of the iris and choroid. It is not worth while to attempt any detailed account of the symptoms which belong to acute cyclitis, because they are masked by the accompanying affection. It may, however, be said that when a considerable quantity of opaque material is found in the anterior part of the vitreous, it is the product of inflammation in the ciliary body.

Another phase of acute cyclitis is one which arises from secondary syphilis, and which I have seen in negroes several times, as well as in white persons. There is an excessive production of plastic lymph, which infiltrates and pushes out the sclera until it forms a distinct projection in the ciliary region. It may be small or as large as the tip of the little finger. It reaches its maxi-

mum growth in a few days and is accompanied with all the signs of severe iritis. It has a yellow color, overlaid by enlarged vessels, remains stationary for two or three weeks, and slowly disappears. Sometimes the globe recovers its rotundity, at other times a bluish prominence remains to mark the place of exudation, constituting a ciliary staphyloma. During the progress of this malady there is much pain, hyperæmia, and all the marks of inflammation, and the sight is almost totally lost during the acute period. After recovery, sight in some measure returns, but is very poor. The eyeball may pass into atrophy.

Ciliary staphyloma. It has been remarked that staphylomata may be found after acute plastic cyclitis. A more ordinary mode of their occurrence is after attacks of ciliary inflammation not attended with such copious plastic exudation. There is a succession of attacks which may appear to be episcleritis of the ciliary region. The trouble may alight upon the same spot many times or upon different spots. Each attack causes pain and dimness of sight and leaves the sclera thin. Gradually, under protracted irritation and the secretion of serum, the softened sclera stretches at the spots of inflammation and staphyloma occurs. There may be a single one of considerable size, and its bluish-black hue may suggest melanotic cancer. There may also be a chain of them surrounding the whole cornea, and suggest the analogy of a large seed capsule of the poppy. The disease which attains this development requires years for its progress. It is remarkable how exempt the cornea may be from trouble, while the iris and often the lens are diseased. The globe is usually plus in tension, but not to a degree to cause pain when there is no acute process.

Glaucoma. A disease to which careful attention should be given is glaucoma. It may occur under a guise which shall arouse little suspicion of its mischievous character, or it may terrify by the

most storiny attack of inflammation. The disease appears in the former case under the name of glaucoma simplex, and in the latter as acute or fulminating glaucoma. Sometimes the former stage precedes the latter, while the simple form of the disease may eventuate in total blindness without a pang of pain.

The one symptom which characterizes the disease is increased tension of the eyeball. Many other signs will concur with this, but the hardness of the ball is the pathognomonic fact.

After making this statement, it becomes needful to qualify it by remarking that there may be an advanced state of glaucoma which will require a nice sense of touch to discover the existence of increased tension. It is sometimes a delicate question of diagnosis as to the existence of simple or non-inflammatory glaucoma.

The three other symptoms to be looked for are : Im-
 pairment of direct vision, limitation of the visual field,
 most apt to appear on the nasal side, and excavation of the optic
 nerve, as seen by the ophthalmoscope. There may be little or no
 pain ; the pupil will often be active. There may be no engorgement
 of external vessels ; usually there will have been obstructions of
 sight, or flickerings of subjective light (phosphenes). The at-
 tempt to use the eyes will be fatiguing. Very often there will be
 a sudden occurrence or increase of presbyopia. The persons
 affected by this disease are usually past forty years of age, and in
 most cases above fifty. The slow and painless progress, the
 absence of abnormality in the external appearance of the eye, com-
 bine to make a false impression as to the nature of the trouble.
 It is thought to be a hopeless case of amaurosis, or incipient
 cataract. In either event the patient is liable to delude himself
 with doing nothing.

While admitting that some cases may tax the skill of an expert in diagnosis, I must put emphasis on the assertion that in most cases the physician's finger will determine that the patient's eye,

compared with the feeling of his own globes, is unnaturally hard ; and, furthermore, it is easy to show that a part of the field of vision has passed into darkness. If this be found on the nasal side, most decidedly there will be sufficient ground for the diagnosis of glaucoma. As to the manner of examining the field of vision see page 91.

Inflammatory glaucoma. Inflammatory glaucoma, in whatever phase, is readily recognized. The amount of inflammation varies in every degree. The cases are called acute, sub-acute, and chronic.

The acute form, beginning with the features of an ordinary cold, develops rapidly and shows unmistakable evidences of its gravity. There is intense hyperæmia of the eye, free watery secretion and soon chemosis occurs ; the lids become tumid, the sight rapidly declines to blindness, and pain is most intense. There is murkiness of the aqueous humor, discoloration of the iris, enlargement and immobility of the pupil ; the interior of the eye cannot be explored with the ophthalmoscope. The eye when touched presents the most decided resistance. Its hardness is sometimes masked by the great edema of the lids and circum-ocular tissues, but when pressure is firmly made the increase of tension is manifest. Often the tactile examination is quite painful. There is also pain shooting into the head and temple. Sometimes there is abundant muco-purulent secretion from the conjunctiva. This array of symptoms can hardly be misconstrued. The cases with which it might be confounded would be phlegmonous inflammation in the orbit, suppuration of the eyeball, or acute purulent conjunctivitis. From all these conditions the dilation of the pupil and the hardness of the eye are distinguishing marks. The development of acute glaucoma is far more rapid than of the other affections. Neither is it attended with ulceration of the cornea, as in acute purulent conjunctivitis, nor would it have the yellow reflex coming from the interior of the vitreous chamber, which would exist in any case of suppurative choroiditis likely to be

confounded with acute glaucoma. Nor would there be the displacement of the globe in the orbit which would be caused by an orbital phlegmon.

Sub-acute glaucoma.

There are cases of glaucoma in which inflammatory symptoms take place with moderate severity, and after a brief continuance pass away. There would be circum-corneal injection; the larger vessels become prominent as well as the ciliary net-work; the cornea grows a little hazy, and possibly loses some of its sensibility when touched; the aqueous humor becomes murky and the iris discolored; the pupil is manifestly enlarged and sluggish; ophthalmoscopic examination is difficult, and exhibits a cloudy state of the vitreous, and the excavation of the optic nerve which characterizes glaucoma. There is decided pain in the eye and forehead, great loss of sight, so that all objects are veiled, limitation of the field of vision, and at some time of the attack, there would be phosphenes and iridescence of the flame of a lamp or gas-burner. Such attacks, after lasting a few days, might pass away with little vestige of their occurrence, or they might leave behind an increased and permanent loss of sight, and in addition, perhaps, symptoms of continuous inflammatory irritation. If such were the status of the eye, the case would be classified as sub-acute inflammatory glaucoma.

Chronic glaucoma.

When the eye has for a long time been subjected to the morbid process now being considered, a state known as chronic glaucoma is attained. It may be attended with little or with severe pain. There is no sight and often no perception of light. I have sometimes condensed the rays of the sun with a two-inch lens upon the cornea for an instant, without evoking any sensation of light. The eyeball is hard, like a stone. Its surface is pale, and traversed by large and tortuous vessels, which spring suddenly out of the sclera at a point about four millimeters from the cornea, and pass backward in the direction of the recti

muscles. Sometimes these vessels are varicose and snaky ; they are always dark and conspicuous ; exceptionally there is a mesh of fine vessels close to the cornea. All these vascular abnormalities suggest the existence of great hindrance to the intra-ocular circulation. The cornea is dull, its surface a little dim or even dotted with facets. It is extremely insensitive to the touch of a feather or a wisp of paper ; the aqueous is hazy, the iris of an unnatural hue, the pupil large, perhaps expanded almost to the diameter of the cornea, and the iris reduced to a narrow and discolored ring. The anterior chamber is remarkably reduced in depth ; especially is this true when the pupil is most expanded. The lens and iris then press forward so as almost to touch the cornea. The color of the pupil—that is, the reflex from the interior of the eye—will be smoky or amber or greenish. The last-named tint is so frequent as to have given name to the disease. If the lens be very opaque, as is often the case, the color of the pupil will be more dark and yellowish. Oftentimes there is complete cataract. The condition of all the transparent structures is so disordered that the hue of the pupil is never normal, and varies through every shade of discoloration. As happens in all cases where perception of light is abolished, the eye does not fix correctly in the direction to which the mind is turned. This condition of affairs may remain without change for many years. In most cases there is more or less neuralgic pain. Sometimes a violent attack of acute inflammation takes place.

Sometimes the eyeball shrinks afterward and becomes atrophied. I have never seen this take place, nor have I seen the globe rupture.

A further process of degradation in the ocular structures may occur in extreme cases, that the globe becomes staphylomatous, either by general distension or by the formation of protrusions at various parts of the sclera.

Secondary glaucoma.

The name secondary glaucoma designates such cases as fall into a condition of increased ocular tension from causes other than those which belong to primary glaucoma. For instance, traumatic cataract may excite so much reaction by the swelling of the lens as to cause copious intra-ocular effusion, with violent pain, inflammatory symptoms and loss of sight, and be justly considered a glaucomatous disease, in virtue of the exaggerated tension. The presence of a foreign body in the eye may set up the same class of symptoms. The growth of an intra-ocular tumor will sooner or later bring about this result. Certain cases of irido-cyclitis with total posterior synechia eventuate in secondary glaucoma. In all these cases the features of the original disease will be mingled with those which constitute the glaucomatous condition. Oftentimes no examination of the interior of the eye is possible, and the state of the deeper parts cannot be stated.

Avoid atropia.

A word of caution may be added on a point which needs to be guarded. The resort to atropia in cases of suspected glaucoma, as a means of aiding diagnosis, is to be avoided. The mydriatic has a hurtful tendency, and sometimes it will precipitate an attack of acute inflammation. This may happen even in glaucoma simplex, and is more likely to happen where inflammatory mischief has already begun.

Cataract.

Opacity of the crystalline will be easy of discovery in just the proportion that it is intense. When the lens is decidedly opaque, whatever its color, the localization of the opacity in its substance is decided by noting the following points: 1st. The amount of opaque surface which can be seen is measured by the size of the pupil; the expansion of the pupil exposes more opacity, its contraction exhibits less. 2d. A look at the eye in profile shows that the opacity is behind, not only the cornea, but behind the iris. 3d. The use of atropia and focal illumination display the seat of the opacity decisively.

If the lens is not thoroughly opaque, difficulty may arise. The means of determination, besides the considerations above stated, are the illumination of the eye by the ophthalmoscope and the use of Scheiner's test. Focal illumination and the ophthalmoscope will always establish the diagnosis when certain optical principles are appreciated. Scheiner's test was formerly important when the ophthalmoscope was unknown, but is now of use only in case the presence of the lens in the pupil is under investigation.

In the early part of this lecture, attention was called to the fact that the crystalline undergoes a change of texture as life advances, and that, by acquiring a yellowish shade, it sometimes simulates cataract. The lens, in this condition, does not transmit light as readily as in youth ; it is less transparent, but this state of sclerosis is to be distinguished from real cataract by the fact that no material obstruction is offered to the illumination of the eye by the mirror, while it is also true that the eyes of old people do not light up as brightly as in early life. The importance of this caution lies in the fact that to the naked eye and by focal illumination the pupil will appear densely smoky.

Partial cata-
ract. A few words must be devoted to the enumeration of various forms of cataract, classifying them according to their physical appearances.

1. *Partial Cataract*.—Anterior polar cataract is an opacity on the center of the front of the lens. It is due, in the great number of cases, to perforation of the cornea from ophthalmia neonatorum, and consists in deposit upon and thickening of the capsule, and alteration in texture of the immediately underlying lens fibers.

2. *Laminated or congenital nuclear cataract* is an error of development. The central part of the lens is opaque, while both in front of, and behind it, the substance is clear. The margin of

the lens, also, is clear, and the distinctness of the cataract will depend upon its size. With a dilated pupil such cataracts are beautifully distinct. Patients thus afflicted are often thought to be myopic, and not suspected of the more mischievous condition.

3. Posterior polar cataract lies upon the back surface of the lens. It may be spread over the whole area, or be confined, as is oftener the case, to the central part of the surface. This condition implies some morbid process going on in the deeper parts of the eye—usually some form of choroiditis. Often it is associated with opacities in the vitreous and degenerative myopia.

4. *Incipient Cataract.*—This appears either in the edge of the lens, or in the nucleus, or both at once, or as minute dots scattered all through the substance. When the edge of the lens begins to become cataractous, streaks or wedges of opacity begin to come down toward the center—it may be singly or in groups, many or few. They are to be found by the ophthalmoscope with ease, and in this regard the instrument may be greatly useful to a person who has no knowledge of its application to the discovery of diseases of the optic nerve, retina, and choroid. Seen by the mirror, the opacities appear dark or black, because they simply obstruct light. They are seen best, and the fainter ones can only be brought to view, by using a feeble illumination. The addition of a magnifying lens behind the mirror is a great help. One point in such observations may be alluded to. The striæ of incipient cataract will seem blacker and more dense when seen in certain angles than when viewed from other positions. In other words, as the mirror is tilted a little to and fro, the play of light in the crystalline will cause some streaks to appear and others to disappear—a phenomenon which is explained by supposing that the streaks, when they appear, are due to total reflections of light, and this occurs because along these lines there are fissures in the crystalline, as has been shown by Becker.

Incipient cataract of the nucleus commonly appears as a round blot of opacity not to be resolved by ordinary magnifying powers into special details. It may be of various sizes, and is usually slow in development.

Opaque molecules are sometimes scattered through the whole lens substance ; this is the fact in the cataracts of middle life.

Consistency of cataract. Thus much relates to the mere existence of cataract ; other information must be gotten respecting the consistency of cataract, and whether it is associated with any other disease. This knowledge is needful to a correct decision of the method of treatment.

The consistency of cataract depends chiefly upon the age of the patient, and next upon the manner in which it occurs. The terms soft and hard describe conditions in which the lens will come out of the eye as a pulpy material, or as a solid mass in proper form. Young persons have soft cataracts, and those above fifty years have hard cataracts, while, during middle life, the lens when opaque has a consistency midway between the two. Cataracts caused by injury, when a foreign body has penetrated the lens, are soft. The cataract of diabetes is soft. Senile cataract is hard, but the statement requires this modification, that the nucleus will be hard, while the surface may have become softer, and in cases of long duration, the surface becomes disintegrated to a milky fluid in which a hard nucleus floats. This last condition is known as Morgagnian cataract.

The appearances which indicate the solidity of cataract are as follows : the yellow, or amber, or mahogany color belongs to hard cataract ; when whitish, or bluish, or creamy, the substance is soft ; when there are a few fine striæ, the lens is hard ; when the streaks are wide, or the substance molecular or mushy in appearance, it is soft.

The bulk of the lens is of importance. It will be known to

Size of cataract. be large when the iris is pressed forward, or the anterior chamber shallow. A traumatic cataract is in its beginning large, because the lens swells by imbibition of aqueous. Often the lens matter gushes out of the capsule into the anterior chamber, as the albumen of a boiled egg may press through a crack in the shell. On the contrary, a small cataract permits a full anterior chamber, the iris hangs perpendicularly, and is sometimes furrowed at its periphery.

The use of focal illumination brings out these features with great distinctness.

Immaturity or incompleteness of cataract is best seen by the ophthalmoscopic mirror, but also appears by focal illumination, which shows partial transparency of the lens. By ordinary light, it is often possible to see that the pupillary edge of the iris casts a shadow on the opaque part of the lens, or seems a little removed from it. The degree of vision remaining to the patient will aid this discovery.

Capsular cataract. Capsular opacity appears in the presence of small thickened spots on the surface, sometimes minute, again large and of most varied forms. They have a dead, white look, easily recognized. Sometimes it appears wrinkled, and may have a tinge of yellow. These remarks apply to the capsule when it still incloses the lens. If the lens have disappeared, the capsule may remain as a dense, white, opaque membrane, usually perforated at some places with holes, because the lens has been absorbed subsequent to an injury, or been removed by an operation. The extreme depth of the anterior chamber will suggest the absence of the lens, and the optical methods of examination will settle the diagnosis.

Milky cataract. One point omitted above in physical appearances of cataract is, that there are rare cases in which the whole lens has passed into a milky or gruel-like consistence. This occurs

in the soft cataracts of persons between fifteen and thirty years of age. Again, in the Morgagnian cataract, the presence of the fluid material is known by observing that the nucleus changes place as the person takes a different posture. When erect, the yellow nucleus will show its margin in the pupil, its center being below the axis of the eye. If the head be bent to one side, the nucleus will roll in that direction. When lying on the back, the fluid part only will be visible, as the nucleus settles back on the posterior capsule.

Effect of cataract on sight.

Another matter remains for diagnosis—to ascertain the functional condition of the eye; that is, to learn whether the visual perceptive faculty is good, or whether there is some disease added to the cataract. In every case of uncomplicated cataract, it should be easy for the patient to discern feeble degrees of light; he should know with certainty the direction in which a candle is held, and when pressed with the finger, the eyeball should in all parts respond by the production of a phosphene. If these three modes of exploring the retina do not yield

Complicated cataract.

satisfactory results, there is some disease in the eye. In case of deficient perception of light, there may be haziness of the vitreous, the two other tests being pretty well responded to. If there be feeble perception of light, and the situation of a light cannot be designated correctly in all directions, there is reason to suspect disease of the optic nerve, or retina, or choroid, or glaucoma. If there be deficient perception in only one direction, and good perception in other directions, there is strong suspicion of detachment of the retina by effusion between it and the choroid. If the patient before developing cataract has been myopic, there is reason for believing that the tissues of the deep parts of the eye are unhealthy. Adhesions of the pupil make it probable that not only iritis but cyclitis and choroiditis co-exist, and necessarily impair the prognosis of an operation.

Intra-ocular
tumors.

Intra-ocular tumors cannot be fully revealed without the use of the ophthalmoscope. But quite often they betray themselves to the naked eye, by the yellow or red color which is reflected from their surface through the pupil. Then, instead of the normal black, the pupil shows a glistening yellow hue, which will be caught when the observer places himself between the eye and a window. Usually there are no outward signs of irritation until after the tumor becomes of considerable size ; then ensue general inflammation, increased tension, and severe pain.

Plastic cho-
roiditis.

Plastic choroiditis also produces a similar reflex from the pupil, and by its physical appearances cannot be certainly distinguished from a tumor. The previous history will, however, give important information ; because there has usually been either cerebro-spinal meningitis, or some disease from which the eye-trouble has sprung by metastasis. It will be generally true that the tension of the eye will be below standard. The progress of the case will be toward atrophy of the globe, and there will be no period of increased irritation.

A plastic irido-cyclitis may supervene upon an intra-ocular tumor.

What has been said embraces an epitome of diagnosis of the inflammations of the visible parts of the eye and their consequences. It has not been my purpose to discuss the deep-seated ocular affections, nor the perversions of function which concern refraction

Amaurosis and
amblyopia.

and adjustment. The first-named diseases are generalized as amaurosis and amblyopia, the second group are included in the word asthenopia.

Asthenopia.

By the ophthalmoscope the first group and most of the second group can be clearly distinguished. Without it most opinions are worthless guesses. Moreover, to a full understanding of the troubles of refraction and accommodation, a complete set of spectacle glasses are indispensable. The physician must

also be familiar with the principles of elementary optics. The scope of this lecture does not permit me to touch on this important and fruitful theme. In this department the most signal advances in practice have been made ; and persons are, by a suitable selection of spectacles, made comfortable in the use of their eyes, who would otherwise be condemned to perpetual distress, and be tortured by painful and useless medication. It may be proper to state that the errors thus to be relieved are comprised under the names of hypermetropia, myopia, astigmatism, presbyopia, and spasm of accommodation. Sometimes these conditions are confounded with disease of the nervous system.

Hysterical photophobia. Closely allied to the last-named troubles is a condition which may be called hysterical photophobia. The term designates the chief symptom. The patient, who may be a man or a woman, is utterly incapable of enduring exposure to light, and shrinks from it with most decided aversion. Not to be buried in darkness causes severe pain, lachrymation, and uncontrollable spasm of the orbicular and facial muscles. The face is covered by the hands, and the whole manner expresses anxiety and distress. Some of these cases are at bottom instances of error of refraction, and have been brought to this strait by the combined effect of poor health and overwork of eyes. The photophobia is sufficient proof of the perceptive function of the retina, and the diagnosis of the actual fault in the eye can only be made after the spasm and hysterical element have been set aside. This may need anæsthetics or anodynes, and then the patient will be ready for examination. There is generally palpebral conjunctivitis, as remarked on a previous page, and sometimes the cornea is a little hazy.

Muscular diseases. We pass now to consideration of troubles of the muscles of the eye. We have muscular asthenopia, nystagmus, paralysis, and strabismus.

The evidences of muscular asthenopia, as distinguished from re-

Muscular asthenopia. refractive and accommodative troubles, are not to be fully ascertained without employment of optical methods of investigation, viz., prisms. But certain symptoms may be elicited which will help to form a general opinion in the case. There will be pain in using the eyes on near objects, just as in other forms of asthenopia, but pain will be the chief symptom. There will not be the occurrence of blur and indistinctness of print which is the invariable fact in refractive asthenopia. Moreover, the pain in the eyeballs often continues when not working upon near objects. The persons thus affected are mostly such as are in poor health, or have suffered from some attack of sickness. Another symptom indicative of muscular asthenopia is that it causes much pain to attempt to read when riding in a carriage or railway car, and the looking at objects out of the window as they pass causes the same trouble. The element of distress in these cases is the inability to keep the eyes fixed steadily on an object, and the want of suppleness, as it may, perhaps, be called, in catching at, as well as holding a point of view. Moving the eyes from one line to another is often painful. Another symptom may be elicited by asking the patient to look upon the tip of the finger brought to within two or three inches of his face. He makes the convergence with painful exertion, and, perhaps, cannot hold the eyes in this situation, but allows one to diverge while the other remains fixed. If this do not occur, put a card or the hand in front of one eye while the attempt at convergence continues, and the covered eye will often be found to have slipped away into divergence. After this, move the finger to extreme lateral positions, and make the eyes follow to the outer and inner angles; in some cases there will be a tremor or jerking movement when attempting to reach these points, or, perhaps, the corneæ will refuse to go to the angles. In this class of cases, as in all forms of asthenopia, there will be more or less palpebral conjunctivitis and the symptoms it produces.

The full development of the facts belonging to these cases requires resort to tests by *prisms*, and I must, therefore, here dismiss the subject.

Nystagmus. The condition known as nystagmus may be considered an aggravation of muscular asthenopia, but it usually lacks the element of pain. The eyeballs are incapable of steady fixation in any position or for the briefest period of time. They oscillate in quick, jerky motions wherever they may be directed. Usually they do not move together, even in a general sense, without a special effort, and each by itself keeps up the quivering movement. When excited the motions become rapid and irregular. It is evident that there is in many of these cases a defect in the innervation of the muscles, but the ordinary cause of the nystagmus is some congenital obstruction upon the axis of the eye. For instance, this is a feature in some cases of congenital cataract, whether the lens be partially or wholly opaque. It also exists in the eyes of albinos, in whom the retina is blinded by the flood of light poured upon it, and not properly dampened by a pigmented choroid. To some extent, but not so seriously, do patients, the rare cases born without iris, suffer in the same way. A lesion of the choroid or retina at the center of the eye, such as atrophy or exudation, by destroying the predominance of perception which the macula lutea ought to enjoy, is a common cause of this unsteady fixation. The explanation of the condition lies in the fact that the purpose which controls the movements of our eyes, and by which we are educated to direct them, is that we may bring to bear upon an object the yellow spot of the retina, because this is largely superior to all other portions of the membrane in degree of sensibility. In the cases now being described, the defect of central vision has deprived the person of the motive which teaches the infant to govern the ocular muscles. In later life, although this defect of sight may be corrected, as by

operating for congenital cataract, the nystagmus is not overcome. Even if vision be made nearly normal, as sometimes is attained, the want of training of the muscles, at the outset of life, continues to prevent them from acquiring needful power of co-ordination. Children born with no power of sight, or who lose it at an early period, do not show this irregular muscular action.

Paralysis of muscles.

Paralysis of ocular muscles is a condition frequently presented to the general practitioner. It occurs during the progress of various affections of the nervous system, both chronic and acute. It may also occur as an exclusively local disease. The chief symptom which indicates it is double vision. Of course this implies that the patient possesses two eyes of nearly equal degrees of sight. There may be monocular diplopia, but it is so rare that it may be disregarded. It depends on irregular refraction, while binocular diplopia depends on the misdirection of one eye, when the other looks at an object. The image of the object will then fall upon parts of the retina which are not in harmony, and thence the object is seen double. The parts of the two retinae which correspond are the right and the left halves respectively, and the upper halves and lower halves. The division of the fundus oculorum into quadrants by vertical and horizontal meridians will define these relations. If now the image of one object fall upon the center, say of the right retina, and on the inner half of the left retina, double vision will ensue. The image seen by the left eye will appear as if it came from an object to the outer or left side of the true place of the object—that is, the images are said to be homonymous or correspondent, because that seen by the left eye is on the left side, and that seen by the right is on the right side. This can be caused by some displacement of the left eye, so that its inner half is brought opposite the object, which obliges the cornea to turn to the nose, and means convergence of the visual lines. This may arise either by spasm

of the rectus internus or paralysis of the rectus externus of the left eye. It will be observed that homonymous double images and undue convergence are inter-dependent. If now the left eye turn outward while the right looks at an object, the outer half of the left eye will receive the image of the object, and it will appear as if it were really far to the right of the true place of the object ; the double images will then be crossed. The eyes will be divergent, so that crossed double images indicate divergence of visual lines. So, too, if in the left eye the lower half of the retina receives an image which in the right eye falls at the macula lutea, the left will locate the object above its true position ; *i. e.*, the false image will be higher than the situation of the true ; the lower half of one eye will be presented to the object ; this can occur only when the cornea is displaced downwards ; that is, there will be spasm of the muscles drawing the eye down, or paralysis of those drawing it up. In other words, suppose a red glass placed over the affected eye, and the object a candle flame, paralysis of a levator muscle causes double images vertically arranged, and the higher image belongs to the paralyzed eye. Correspondingly, paralysis of a depressing muscle causes double images, one below the other, and the image seen by the affected eye is the lower. By this method of observation and reasoning, acting upon an accurate knowledge of the precise function of the several muscles, both singly and in combination, a diagnosis can be reached of just what muscles are affected. Sometimes this is practically easy, at other times it is very difficult. Difficulty arises from several causes, *viz.*, muscles may be partially and not wholly paralyzed, and their influence in the movement will be miscalculated. Again, after paralysis of one or more muscles, the antagonist groups become contracted and thereby cause an excessive effect ; a patient is often so confused by the images as to be unable to give the facts correctly, or there may be such fatigue or irregularity in the move-

ments that the images do not always appear in the same relations. Without dwelling further on this matter, another symptom may be mentioned of paralysis of ocular muscles, that the eye fails to turn to the full extent in the direction of the impaired muscle. For the external rectus, the eye fails to go completely to the outer canthus, and in attempting to do so, converging strabismus occurs ; while the eye, striving to reach the position desired, jerks unsteadily as it struggles to make the excursion.

Much more might be said on this subject by entering into the details of the effects of paralysis of each muscle, or of groups of muscles. The combinations which may arise among six pairs of muscles are not unlike the moves on a chess-board in complexity, and I therefore refer you to the text-books for this discussion. (See Wells, Alfred Graefe, Woinow.) These particulars may be added :

Paralysis of 3d nerve. that paralysis of the third nerve of one eye destroys the functions of five muscles and of the pupil, leaving the external rectus and superior oblique alone in action ; the eye will stand at the outer angle and downward ; the pupil will be dilated and the upper lid drop over the eye.

Paralysis of 6th nerve. Paralysis of sixth nerve affects but one muscle, the rectus externus, and the eye stands at the inner angle in converging strabismus, but capable of movement in all directions except outward. In all varieties of paralysis another symptom is conspicuous, viz., that the patient carries the head in such a way as to enable him to avoid double images as much as possible. For instance, with the left externus paralyzed, he must turn the head around to the left side, to compensate by the twisting of the neck what he cannot accomplish by the rotation of the eye ; the head will therefore be carried with a turn to the left shoulder. This is a symptom in all cases of ocular paralysis, when double images are annoying. It may not appear if the images are separated very widely, because

one is then so dimly perceived as not to attract attention and give annoyance. In these cases the patient resigns himself to the use of only one eye.

Paralysis of 4th
nerve.

In paralysis of the fourth nerve, which animates the obliquus superior, the eye does not show any displacement of the cornea, but is unable to move freely downward and outward, and in the attempt to reach this angle, it performs irregular, wheel-like movements, under the unbalanced action of the obliquus inferior. The motions specified are made around an axis from before backward, nearly in the axis of the orbit. There will be vertical double images, and by them chiefly will the diagnosis be made.

Any one muscle may be paralyzed without concurrence of other muscles, or several which are disassociated may be affected and make a problem sometimes exceedingly complicated.

Strabismus. The subject next in order is *strabismus*. This is a defect so conspicuous as to be constantly referred to the physician for advice. It may be the consequence of muscular paralysis, more frequently it is the effect of muscular spasm; sometimes it is the result of muscular relaxation. The first consideration of this topic requires not only a study of the action of the muscles, but also of the functions and quality of sight. *Strabismus* may be in its origin a muscular disturbance, and afterward have a damaging influence on sight; or it is often in its origin a defective condition of sight, which brings in its train muscular disturbance. This may be either spasmodic contraction or relaxation. In the method of treatment it always becomes needful to restore the muscles to their proper activity and relations. This may be all that the case will admit of, or the patient desire. An operation must be done for this purpose, but when this is performed, the full demands of the case have in many instances been by no means satisfied. The existence of *strabismus* denotes that the

patient enjoys the use of only one eye ; each may be used alternately, but only one at a time. The perfect cure of strabismus consists in conferring the power of correct use of both eyes at a time. It seems to be sometimes true that a kind of binocular vision is possessed by some patients with strabismus. They have learned to co-ordinate incongruous parts of their two retinæ, but this vision is very inferior to normal binocular sight.

It will be found, in the greater number of cases of strabismus, that one eye is very deficient in acuity. Because of this fact, and that the image is received in the deviating eye upon the remote and duller parts of the retina, there is rarely any complaint of double vision.

It therefore comes next in order, after recognizing the dissociation of the axes of the eyes, to examine the acuity of sight of each and the causes for any imperfections. It is often difficult for the patient to hold the feebler eye with sufficient steadiness to test its capacity. The effort may even be painful. Its incompetence may be due to torpor of the retina, or to error of refraction, or to both combined. Loss or want of sensibility of the retina is an effect of disuse, and may therefore be always reckoned upon as a complication to some degree. It is often extreme in amount, and may be sufficient by itself to render binocular vision unattainable or valueless. At the same time refractive errors are extremely common. For example, small central opacity of the cornea, congenital cataract, hypermetropia, one-sided or excessive myopia, and astigmatism, both regular and irregular. To these errors must be added central atrophy of the choroid and atrophy of the optic nerve.

Strabismus convergens is in most cases the expression of a laborious effort to see ; it is a means of aiding the accommodative faculty by invoking the help of the recti interni. These muscles, constantly tasked to excess, undergo contraction, which results in

permanent deformity. There is a period when the muscle has not yet undergone essential structural change. These are the cases of occasional squint. In them, if the accommodation be suspended, the deviation will diminish or disappear. Hence in some cases, and especially in young persons having much hypermetropia, the energetic use of atropia will remove the squint, so long as the effect is kept up.

The discovery and valuation of these visual disturbances will require the help of the ophthalmoscope, the spectacle box, and test types. I can, therefore, merely state the necessity for the investigation, without attempting to describe it. I may venture a little out of the limits of this lecture to say that, having determined the errors, and corrected them, so far as may be possible, by glasses, a process of training must be undertaken, to educate the patient to the correct use of his eyes in combination, after the deformity has been removed.

Varieties of strabismus. The diagnosis of strabismus as a deformity is usually simple enough. Sometimes it only occurs occasionally, and when the patient is looking at something intently. It may come on after illness and disappear when the health is restored. Converging strabismus is the most frequent deviation, diverging strabismus is next in frequency, while the squint up or downward is the least common. Converging strabismus is often a little oblique upward and inward. It is usually Strab. alternating and concomitant. alternating—that is, when either eye fixes, the other squints, and the eye which is habitually turned squints most. Moreover, the squint is often concomitant—that is, whichever eye is used, the movements which it makes are accompanied by the fellow at its habitual angle of inclination. As would be expected, the convergence increases when viewing near objects.

Distinction from paralysis. The symptoms described differ notably from those of paralysis, because in the latter case there is inability

to move in certain directions, while in true strabismus the mobility remains, but the aim is faulty.

There may have been at one time paralysis, but the muscles have recovered, while their antagonists have undergone contraction. In all cases, therefore, there is contraction of the predominant muscle. It follows, also, from what was said about the alternation and concomitance of movement, that both eyes will be found affected, although patients suppose but one to be at fault. The amount of strabismus is to be measured accurately only by taking the deviation in angles, but for practical purposes it is enough to measure along the border of the lower lid, viz., to take the distance from the middle of the palpebral fissure to a point on the edge of the lid which shall be vertically beneath the middle of the pupil, and to measure when the eyes are directed to an object about two feet distant.

Besides this measurement, attention should be given to the potency of the antagonist muscles, *i. e.*, to observe how far they may be able to carry the eye in their direction. They may be found to be quite feeble, as shown by the failure to pull the cornea as far as it should reach, and by the jerking of the eye as it approaches the extreme limit of rotation.

Of divergent strabismus it may be said that it does not so often depend upon a persistent contraction of a muscle as does the opposite deviation. It is rather the abandonment of the effort to see, and of any concern about the behavior of the eye. The eye takes the position to which the shape and axis of the orbit incline.

Orbital cellulitis. Inflammation in the orbital tissue is an occasional occurrence and deserves a few words. It varies in severity and may occur at any period of life, but is most common in children. The early symptoms will be swelling of the lids, without affection of the eye or injury to sight; the globe will be pushed forward as well

as in some other direction, and may in severe cases be hindered in its movements. If the action be intense, there will be chemosis and redness of the ocular conjunctiva as the protrusion of the eye increases, and there may be loss of sight by inflammation of the nerve or of the choroid. Careful exploration with the finger will often discover a deep hardness of the soft tissues of the orbit, and sometimes marked tenderness on pressure. An important help in diagnosis is to pass the finger under the upper lid to the cul-de-sac, and explore the orbital space between the globe and the brow. The patient must be under an anæsthetic, and the surgeon's finger should be small and moist. A spot of firm yet elastic resistance, or a layer of dense tissue under the roof of the orbit, will be strongly suggestive of an inflammatory focus, and indicate how deeply an incision should be made. To do this with a narrow bistoury, guided by the finger under the lid, will secure protection to the eyeball and accuracy to the incision. The degree of pain is variable, often it is slight. Headache may occur, and there may be some febrile movement. The development of the symptoms to a critical climax will be reached in from five to fifteen days, and after a time there would be dusky reddening of the skin of the lids and discharge of pus, either by the lids or through the conjunctiva. It is, however, not advisable to wait for this completion of the process before giving vent to the pus.

Orbital tumors. A condition to be distinguished from the above is the growth of tumors in the orbit. In all the symptoms which arise from the increase of the contents of the orbit, these cases will resemble orbital abscess; but the absence of inflammatory signs will be the chief mark of distinction, in addition to the slowness with which tumors usually develop. The mere presence of a tumor in the orbit is not usually a difficult question, but to decide upon its precise nature is often perplexing. The important point is to recognize whether tumors are so limited to the orbit as to

admit of removal, or whether they penetrate into adjacent cavities. The class which find their way into adjacent parts, either by the natural fissures or by absorption of bony walls, are commonly malignant. They will make their true nature suspected by the abundance of venous trunks which are apt to appear upon the brow and temple, by the tenseness of the orbital tissues, and by a careful digital exploration around the margin of the orbit.

Examination of
the nostrils.

An examination of the nostrils should never be neglected, both in front and behind. A bright light and proper laryngeal mirror, an ear speculum and a rhinoscopic mirror, are necessary facilities. These are useful in cases of chronic inflammation of the orbit with possible necrosis of bone, as well as in case of tumors. Sometimes an abscess will open in this direction, and the place of discharge be indicated by a mass of granulations, while an orbital tumor may occupy a part or all of one nostril. It is manifest that one would shrink from attacking a tumor whose vigor of growth and extensive ramifications make it probable that it is of a cancerous and highly malignant nature.

Aneurismal tu-
mors.

Another form of tumor which occurs in the orbit is aneurismal. To set forth all the uncertainties which hang about the diagnosis of this condition would require an extended lecture. I can only briefly state that the common symptoms are : that there has been some injury of the head ; the tumor has grown pretty fast without inflammatory signs ; there is pulsation when the finger is pressed into the orbit ; a bruit can be heard by putting the ear over the temple or on the eye ; often the patient hears the bruit ; both pulsation and bruit are abated or stopped by pressure on the common carotid. When these phenomena exist, it yet remains undecided whether the case is one of aneurism of an orbital artery, of communication between the cavernous sinus and an artery, or of thrombosis of the cavernous sinus. Even an erectile tumor may closely resemble a true

aneurism. Inasmuch as the relief of these cases requires the serious operation of ligature of the carotid, the importance of diagnosis will be appreciated ; for true aneurism, the operation would be a cure ; for the other conditions, it would only bring partial relief.

Exophthalmic goiter. Exophthalmic goiter, or Basedow's disease, is a disease easily recognized after having once been seen. The three factors which belong to it are : 1st. Prominence of *both* eyeballs, with a peculiar stare, and without limitation of motion. 2d. Enlargement of the thyroid gland. 3d. Palpitation of the heart, without organic disease and with great quickness of pulse. The protuberance of the globes is more conspicuous, because the upper lids seem retracted and uncover the sclera above the cornea ; often they are unable to cover the eye during sleep. This retraction of the upper lids contrasts with the condition observed when tumors push out the eye, because, in the latter case, the lid appears to grow with the advance of the eye, and always suffices to cover it. The occasion for the displacement of the eye in the cases spoken of is enlargement of the orbital veins. There is no pulsation or bruit, and firm pressure can push the globes to some degree into the orbit.

There are cases in which the chief symptom is the exophthalmos without the goiter, and with the irritability of the heart.

It has occurred to me, moreover, to see a case of exophthalmos of both eyes, which had taken place suddenly in a **Exophthalmos from supposed thrombosis.** young married woman soon after miscarriage. There was no pain in either the eyes or head ; there was a degree of vertigo and mental confusion ; she could not attend to ordinary duties for a few days ; but there were no other symptoms which she could relate. I saw her about two weeks after the occurrence. The protrusion of the eyeballs was symmetrical, and so

conspicuous as to excite remark ; the upper lids were not retracted ; there was no pulsation or bruit ; the thyroid was of normal size ; the pulse was quickened by the examination, but there had been no palpitations of the heart. My conclusion as to the cause of this condition was, that there had been thrombosis in the cavernous sinuses, without exciting inflammatory symptoms. By the ophthalmoscope the optic nerves were found congested.

Injuries and Wounds of the Eye.—On this subject it is not necessary to dilate. Most cases are sufficiently easy to understand, and the questions of diagnosis which can arise are few. 1st, the extent of injury after wounds or blows is important to be ascertained, and 2d, Extent of injury. whether a foreign body have lodged in the eye is the most momentous question. The extent of injury is recognized by observing whether there is prolapse of iris, or that it has been torn from its periphery ; whether the lens is clear ; whether there is prolapse of vitreous. Blood in the anterior chamber need not be a dangerous sign, while blood in the vitreous is much more serious. Discoloration of the lens always implies a severe lesion. Remarkable exceptions occur—as, for instance, to see the sclera ruptured near the cornea, the lens to be thrust through the wound, and either escape or be lodged beneath the conjunctiva ; after weeks of inflammation to find the eye, with a proper glass, possess vision $\frac{2}{3}$ or $\frac{3}{4}$. This is a narrative of what I have seen. The nature and severity of the injury will control the judgment as to how much mischief has been inflicted. Sometimes the whole eye is collapsed by an extensive laceration. Such destruction is most often caused by explosions in blasting rocks.

Foreign bodies in the eye. Lodgment of a foreign body in the eye is so certain to entail the loss of the organ, and to be accompanied sooner or later by sympathetic trouble in the fellow eye, that the most careful attention must be given to the ascertainment of the truth. The points of inquiry are : 1st, The nature and

method of the accident ; 2d, The lesions, both immediate and consequent ; 3d, The effect upon sight.

The kind of accident is often decisive, as when the foreign body is small and propelled with great force. It not only penetrates, but usually remains in the eye. Bits of metal which fly from a hammer, in striking iron, as happens to blacksmiths, machinists, or men who drill rock, and stray shot from a gun, will, in the vast majority of cases, not only enter but remain in the eye. They may occasionally pass through it, but rarely.

A careful observation of the situation, size, and track of the wound, and inquiry as to the course of the missile when it came to the eye are the chief matters of study. The size of the wound is a pretty sure index of the size of the projectile. When small, patients commonly assert that it has not gone into the eye. A hole in the iris, a spot where the pupil has been pinned to the lens, commencing cataract, will make it certain that the opposite is true. If the wound is upon the sclera, the lens and all in front of it may escape injury, and a patient be very strongly impressed with the idea that he has escaped serious harm. But the darkness of the interior of the eye to the ophthalmoscope, and the great loss of vision which blood in the vitreous causes, will dispel this fond illusion. Sometimes there is mutilation of a portion of the field of vision, and preservation of function in the remainder of the field. This points to the part of the eye which has been directly damaged. The course of a foreign body is commonly straight across the globe in its line of flight, and it either sticks to the spot on the interior where it strikes, or it falls down, or glances to some other spot and lodges. The situation in which the visual field may be marred will afford some clue to the probable position of the foreign body.

Oftentimes severe inflammatory reaction is slow to take place ; but, after a few days, exudation appearing in the pupil, and signs

of internal inflammation developing, there can be no doubt that the offending body is within. The inflammatory process may and does pass away after a time, leaving the eye in chronic congestion, tender to touch, and softened, sometimes much atrophied. The foreign body shows no inclination to make its way out of the eye, unless it be large and the eye have been badly lacerated, when this may in time occur. Its continued residence within is a perpetual threat to the other eye.

Cases very rarely occur in which a small projectile gets into the eye through the sclera, and can be discovered by the ophthalmoscope or by focal illumination. This happens with bits of metal, and, perhaps, most often when fragments of percussion caps enter the eye. In some cases no serious mischief has ensued for years or months after the accident, but if the foreign body be large or irregular, it is sure to be destructive. In a very few cases, the removal of the missile, with preservation of sight, has been achieved.

The effect upon sight by the penetration of a foreign body depends upon the size of the projectile, its nature, and the degree of violence it inflicts. The loss of sight, which occurs immediately, depends upon loss of aqueous humor, disturbance of iris, intra-ocular hemorrhage, and wounding of the retina. The internal bleeding is most efficient in the immediate obscuration. The later impairment of vision comes by the development of cataract and by the effusions of inflammation. When great dimness or entire blindness is immediately produced, and the visible lesions do not account for it, it may be asserted that there is copious bleeding into the deep parts of the eye, and the foreign body is within. Even though sight be not at once seriously abated, this is not positive evidence against the presence of the foreign body.

Subsequent marked diminution of sight, with little external sign of reaction, is an argument in favor of the presence of the missile ;

there is in this case a process of inflammation of the choroid and retina going on. I lately removed an eye four weeks subsequent to the injury, when the outward appearances of inflammation had mostly disappeared, and found the foreign body imbedded in a mass of plastic lymph upon the upper and posterior part of the eye; there was an intense local choroiditis. Another result, which comes at a still later period, although it may take place within a few weeks, is partial or total loss of sight by effusion of serum separating the retina from the choroid.

Finally, the important fact to be noted, in all cases of wound or injury of the eye, is what degree of harm has been inflicted upon the ciliary region. This is pre-eminently the sensitive part of the globe. Here the nerves of organic life, the sympathetic and sensitive fibres, are clustered together, and mingled with minute nervous ganglia. Injury of these structures involves the most serious consequences to the damaged eye, and in the great proportion of cases, entails pernicious sympathetic changes in the other. Hence the necessity for careful inspection of the ciliary region, and the gravity of the prognosis when it has been the seat of a wound.



THE MODERN METHODS OF EXAMINING THE UPPER
AIR PASSAGES.*

BY

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GENTLEMEN : It may not be inappropriate, before I proceed to speak upon the subjects proper of to-day's lecture, to enter a plea for the more extended use of the means which we have at our disposal for the inspection of the upper air passages, and to call your attention to the existence of an idea in the minds of very many of our profession, that these methods of physical examination, procedures which necessarily involve the use of special instruments, such as the laryngoscope and the rhinoscope, and require some practice to make perfect, demand such a high degree of skill on the part of the physician, such an amount of toleration on the part of the patient, and the use of such costly apparatus, that they are of necessity confined to the hands of a few, who have by special training learned dexterity in manipulation, and by opportunity and special study acquired the right to denominate themselves *Specialists*.

This view I shall strongly controvert, for I believe that every general practitioner may and should be likewise a laryngoscopist,

* Two lectures delivered at the College during the winter session of 1875-6.

and I know that by the exercise of a moderate amount of diligent practice—in other words, learning practically where and why he fails in examinations, and not relying upon his books alone for his knowledge, by perseverance in the use of the necessary instruments, directed by an intelligent appreciation of the why and wherefore of their application—he may overcome such difficulties as stand in the way of their successful employment, and this with the simplest aids in the way of apparatus. If the practitioner will do this—and I hope to show you to-day how he can most easily accomplish it—I assure him that the results which will be afforded, their importance and interest, and his satisfaction at having mastered the use of an invaluable diagnostic means and therapeutic aid, which to-day are beginning to be considered a very necessary part of medical practice, will most richly repay him for the time and labor which he has expended.

The fact is incontrovertible that the laryngoscopic mirror has not yet come into general and widespread use in our own country, and there can be but one reason for this : that its worth and importance are not as yet fully appreciated, simply because a want of familiarity with its use has not demonstrated its value.

But we all know that time is required for the introduction of any special method of examination into general practice ; the long period which elapsed after the writings of Laennec, before auscultation became, as it is to-day, an indispensable part of every physician's daily work, testifies to this fact. The history of the progress of all the specialities is the same ; ophthalmology and otology are already well grounded in the estimation of progressive medical men ; laryngology, practically a recently discovered art, is rapidly attaining the same position. There is no reason why it should be an exception to the general rule ; but I do affirm that in none of the specialities, so called, has the advance been made more quickly, have the results been more brilliant, than in laryngology, and I here

3] METHODS OF EXAMINING UPPER AIR PASSAGES. 145

include rhinoscopy. No one instrument has, perhaps, so fundamentally changed our preconceived ideas regarding the pathology, physiology, and therapeutics of any one organ of the human body, no one developed a more extensive literature in a few years, and none enlisted more earnest workers in its special field. Could these facts be true, gentlemen, as I think you will admit they are, if the art had been found to be of little value?

In 1838, Porter, one of the earliest writers on diseases of the larynx, asks: "How is a man of experience, when he meets with a case of laryngeal disease, to know whether it is caused by an œdematous condition of the sub-mucous tissue, by a chronic thickening of the mucous membrane itself, by laryngeal ulceration, by destruction of the cartilages, by the presence of abscess or tumor, or by any of those numerous affections which dissection so frequently shows us to be the occasion of death?"

A more recent writer has answered this question by saying that he has only to look, and he will see and know, and we to-day, with our improved means of examination, can emphasize this assertion. The intelligent physician has then only to *look*, for since the introduction of the laryngoscope, the larynx is no longer a hidden organ; light has been literally thrown upon its parts, and upon its pathological conditions, and a diagnosis of the latter rendered easy and accurate—more accurate, perhaps, than we are able to make of the affections of any of the other internal organs, and what is true in this regard of the laryngoscope is also true of the rhinoscope in its special field.

Is it necessary for me, then, to say more, gentlemen, to induce you to turn your earnest attention to these special modes of examination of which I shall speak to-day?

Have I not said enough to demonstrate to you, at least partially, the utility of the instruments, and to stimulate you to learn their use, to make them a part of your practice? A very short

acquaintance of a practical character will render you, I know, their warm advocates, and it will now be my pleasure, as well as my duty, to show you how, with simple apparatus, you may best prosecute your studies—how you may most quickly acquire the necessary dexterity in manipulation, and attain the most satisfactory results.

Three *essentials* are requisite for the methods of examination which I shall describe, and these may either be of the simplest kind, within the reach of all, within the bounds of the most restricted pocket, or of varying degrees of costliness, the latter depending solely upon the elegance and multiplicity of the apparatus, and not upon its utility or necessity ; with a simple, small mirror, and direct daylight alone, the larynx may be inspected, or the mouth and fauces examined—not, of course, in the most satisfactory manner, but in a way sufficient for diagnostic purposes. In default of other apparatus, nothing can be more simple or less costly to the physician than this means. Should he, however, desire to go one step further, and render the process more convenient and more satisfactory to himself, and at the same time more agreeable to his patient, he will need the three essentials to which I have alluded. These are :

1. A mirror.
2. A suitable illumination.
3. A concave forehead reflector.

I include the last, although I know that some will hardly agree with me in classing it as an essential, because I believe its worth in laryngoscopy to be great, and because the physician who has learnt its use will find it a most useful adjunct to many other examinations besides laryngoscopic. By its employment he is also rendered independent of time and season, as far as sunlight is concerned, and may examine his patient in any position without disturbing him—a matter that is frequently important with

5] METHODS OF EXAMINING UPPER AIR PASSAGES. 147

bedridden individuals. Furthermore, familiarity with it renders the acquirement of all the other methods of illumination very easy; and experience has taught me that its use is as quickly learnt by the students whom I have instructed as that of any of the forms of stationary reflecting mirrors, or the use of direct artificial light. While, therefore, I shall describe the method of using the latter, and say a few words about fixed illuminating apparatuses, a class of which Tobold's laryngoscope is a fair example, I shall, in my remarks upon the methods which should be pursued in the various examinations which are to be described, consider that you make use of the forehead reflector with artificial light, and I at once announce myself as an advocate of this method over all others.

Let me now describe to you, as concisely as possible, the character of these instrumental aids, which I have termed *essential*, and then speak of the manner in which they should be employed. The laryngoscopic or faucial mirror consists of a circular bit of good glass, backed with amalgam, and mounted in a frame of German silver. To this frame is attached, at an angle of 120° , a shank four inches in length, that is made of some metal which, while it allows of any necessary bending, is firm; this terminates in, or sometimes slides into, a light handle, so that it may be lengthened or shortened at will, and into which it is fastened by means of a small screw. The diameter of these mirrors varies from half an inch to an inch and an eighth on their reflecting surface; and the most convenient sizes are, for ordinary purposes, those of one inch and half inch; the latter being used alone for rhinoscopy. Many different shapes have been given to the mirror besides the circular; they have been made ovoid—a form which is sometimes useful when enlarged tonsils render the isthmus of the fauces too narrow to permit of the introduction of a circular mirror—oblong, elliptical, and square, with the corners rounded off. But you will

find that the circular glass answers all purposes, is the most convenient, and is the one generally used. The mirrors have also been made of steel, on account of the brilliancy of its reflecting surface ; but they quickly scratch and become corroded, and are only used to-day, as far as I know, for infra-glottic examinations ; that is, examinations made of the inferior surfaces of the vocal cords, through a tracheotomy tube or wound, where the use of a very small mirror is a necessity. The same may be said of mirrors for magnifying the laryngeal picture, which were at one time thought useful ; they have come into disuse, for they only enlarge the image slightly, and are always, of necessity, optically imperfect.

We shall need then, for our purposes, but two circular mirrors, of the sizes which I have mentioned.

Much may be said upon the subject of illumination in general, and various are the views which are expressed as to what the source, character, and method of using the light should be. Time will not permit of my entering into the minute details of the question, nor is it indeed necessary that I should do so. I shall therefore call your attention, as briefly as possible, only to those sources and kinds which will be found most practical for your purposes, premising that you will find the ordinary argand gas-burner, fixed upon a drop light or stand, which is obtainable in all houses where gas is used, or the student lamp, which burns oil or kerosene, amply sufficient for all examinative purposes.

Two great sources of light present themselves for our consideration : these are the natural and the artificial, and either or both may be used directly ; that is, their rays allowed to pass directly into the open mouth of the patient and fall upon the mirror placed in his fauces, or indirectly, when the rays are intercepted by a concave mirror, which is worn upon the examiner's head, and reflected by its means upon the faucial mirror.

7] METHODS OF EXAMINING UPPER AIR PASSAGES. 149

For our natural light we are dependent upon the sun, and here is one of the greatest disadvantages in its use: the sun is not always at our disposal, and when present can only be utilized when its rays incline to the horizontal, and in a room whose location is favorable for their entrance, unless an expensive heliostat be employed; add to these facts the ones that during an examination both physician and patient are exposed to its heat and glare, and that they must change their position from time to time, to correspond with its changing altitudes, and you will readily see why sunlight is not commonly employed, although it possesses some advantages over artificial light which render its occasional use advisable or even necessary. The chief of these is that it presents the parts which it illuminates in their natural colors, and does not intensify or deepen them as the artificial light does, a matter which is often of considerable importance. To utilize the direct rays of the sun for examinative purposes, the patient must be seated with his face towards the window through which its rays enter, and with his open mouth as near as possible within their line of direction; the physician, seated opposite, with his back to the window, introduces the faucial mirror in the manner which I shall presently describe, and allows the rays of light which pass over his shoulder, and have entered the patient's mouth, to fall upon it; and be, by its means, reflected upwards or downwards according as he desires to examine the posterior nares or the larynx.

To use the rays of the sun indirectly, or the diffused daylight of the examining room, the positions of the patient and the physician need only to be reversed; the former sits with his back turned obliquely to the window, and the entering rays of light, which pass over his shoulder, are caught upon the forehead reflector worn by the latter, who sits opposite to him, and are projected into the mouth of the patient and upon the faucial mirror. Bear

in mind, however, that the concave reflector will not answer for this purpose, as it concentrates the rays of light into a focal point, which, to say the least, will be unpleasantly warm for the patient's throat to tolerate, and that a reflector with a plane surface must be used, if this method of examination is followed.

If the physician employs artificial illumination, which, as I have said, he will find it to his interest to do, he may use either the direct or reflected light; the former method being the one commonly employed to-day in France, while the latter is used in England, America, and Germany; any lamp will answer for its source which gives a bright, steady light, and to this may be fitted, if he so desire, a condensing lens, or combination of lenses, and more or less complicated mechanisms designed to regulate the height, position, etc., of the lamp, none of which are, however, absolutely necessary, as he will find the ordinary argand burner to fulfill all practical requirements. For examining by the direct method two plans are in vogue; in the first the patient sits facing the light, the power of which is usually intensified by placing a plano-convex concentrating lens in front of it, or a concave reflector behind it, and the operator then seats himself midway between the patient and the light, facing the former, and introduces his mirror into the patient's fauces in such a manner that he receives upon it the direct rays of light from the lamp as they pass over his shoulder. The method certainly seems easy, but you will find that, practically, the physician in this position is almost sure to obstruct the luminous rays with his head or hand, and cut off his own light, when he attempts to manipulate his instruments. Stoerk of Vienna is the only one who, as far as I know, uses it to-day, and it is only justice to him to say that in his hands it apparently succeeds well. The second method is better, and is the one which we see principally employed in Paris; the lamp, with or without a concentrating lens in front of it, is placed upon a small nar-

9] METHODS OF EXAMINING UPPER AIR PASSAGES. 151

row or round table which stands between the patient and the physician ; the former faces the light, which is adjusted to a height corresponding with the level of his mouth ; the latter sits behind it, his eyes being protected from its glare by an interposed screen, encircles it with both arms, and in this position performs the various steps of his examination, or operation, as the case may be. You will see at once that such a position must be an awkward one, while the distance at which the patient sits from the physician, and the bar to freedom of movement which the lamp presents, render the method a difficult one to attain, even if its inconvenience be denied. Both of these methods, then, which I have described present serious disadvantages, and I assure you that they are far less easy to practice than the examination by means of reflected artificial light, of which I shall now speak. In its performance the lamp, whatever be its mechanical arrangement, is placed at the right side of the patient, a little behind his head, and about the level of his mouth ; the operator, sitting directly opposite to him, and wearing his forehead reflector, brings his head to within about one foot of the patient's—the exact distance depending upon the focal length of the reflector which he uses—catches the rays of light from the lamp upon the reflector, and projects them into the patient's open mouth, causing the illuminated point to lie just where his laryngeal mirror will eventually be placed ; that is, at the base of the uvula.

So much, then, gentlemen, for the method. The forehead reflector I shall describe to you in a moment, so that the point which now attracts our attention is the nature of the light and the form of apparatus that we shall use.

Your choice may have a wide range, the name of the different forms and kinds is legion, but, after all, the basis of each is the same, and they vary only in their details and the number of condensing lenses that are used to intensify their illuminating power.

I have already said that for ordinary purposes there is no better nor more convenient light than that which is furnished by the argand gas burner, mounted upon a drop light, which permits of the flame being lowered or elevated at will. Such a light is certainly easily procurable, and at a slight cost, if gas is obtainable; if not, as in the country, then the ordinary student lamp, which burns petroleum or oil, forms a very efficient substitute. To either of these lamps it is no difficult matter to attach a single plano-convex lens two and a half inches in diameter, which fits into the metallic chimney or tube known as Mackenzie's, if you deem it desirable to intensify their illuminating powers.

Should you wish for a more complicated and showy apparatus, that of Tobold, containing a system of three lenses, is perhaps the best, but you can accomplish nothing with it that you cannot do with the simpler means which I have mentioned. To sum up, then, the whole matter of direct *versus* indirect illumination, and to guide you, perhaps, in your choice between them, I would state that for general examinative purposes, the application of remedies to, or operations upon, the parts which we are to-day considering, the reflected artificial light is, by far, the best and most convenient, for the physician who uses it is much less restricted in his position, is able to follow quickly and accurately any sudden movements which his patient may make, without stopping to re-adjust the light, can sit nearer to the latter, and lastly, will have a better and brighter illumination of the parts than if he use any of the other methods, direct or indirect; and I will again add that I believe he will acquire the use of the forehead reflector more quickly than he can acquire any of the other procedures to which I have called your attention, or fully as soon (and be better satisfied with the results which it furnishes him). For an ordinary examination, made oc-

casionally, and simply for the purposes of differential diagnosis, it is of little moment which method you use—either or any will answer your purpose. Having learnt, however, to use the reflector with artificial light, as you have probably made up your minds to do, you will find it amply sufficient for all your examinations, and as, therefore, you will not need to change from method to method, it will not be necessary for me to spend more time upon this part of our subject, further than to say that in using artificial light it is not necessary, as is sometimes supposed, to have the room absolutely dark ; any room will answer the purpose of an examining apartment, and may be easily sufficiently darkened by drawing down the window-shades. The operator—it is of course understood—would not place his lamp in the brightest daylight of such an apartment, but would arrange it as far away as possible from the window through which the light enters.

Let us now pass at once to the last of our so-called essentials, the forehead mirror or reflector. This is a slightly concave mirror, either three and a half or four inches in diameter, with a focal distance of about twelve inches. The glass may be perforated at its center or simply left unsilvered at that point, both plans having their advocates ; the latter, I think, you will find most satisfactory, and the only objection that I have ever heard urged against it—the liability of a coating of dust gathering upon the uncovered portion and obscuring the view through it—is one that is certainly very easily obviated. How this mirror shall be worn, and how it shall be attached to the operator's head, are also points upon which there is some difference of opinion. Bruns, for instance, says that it should be worn in front of the nose and mouth. Johnson prefers to have it over the forehead, while Czermack, Mackenzie, and others, among whom I rank myself, think that it should be placed directly over one of the eyes, the right, being usually preferred. There is no question but that this last method is the one that

is, theoretically, correct, and it is fully as easy to acquire as the others. The physician then looks through the uncovered portion of the glass, and his eye is within the center of the cone of light which is thrown from the mirror into the patient's mouth, while at the same time his eyes are protected from its glare, for the rays of light from the lamp reach the mirror in an oblique direction, and do not, therefore, strike against the eye which is behind the reflector, while the other is beyond, or rather, to one side, of their line of direction. Both eyes are then to be used in looking at the picture which is reflected in the faucial mirror, and if it cannot be plainly seen with both the forehead reflector is probably too large ; for it must always be in its diameter less than double the space between the individual's eyes who uses it—otherwise it projects either in front of the left eye, or the right is unable to see through its perforation. This point is one which deserves careful attention.

Among the many different modes of attaching the reflector, which I have described, to the head, the commonest, perhaps, and the ones which are to-day most used, are the spectacle frame and the band known as Kramer's. The latter of the two is the one which is commonly preferred, although the spectacle frame is very generally used in London, and, in some instances, in this city. Kramer's band consists of a short metallic strap, which is tightly buckled over the forehead by means of a broad ribbon passing from it around the head ; over the bridge of the nose rest two small padded buttons, which give stability to the apparatus, and prevent it slipping from side to side ; immediately above these is a ball and socket joint, the ball being attached to the back of the round mirror, which is thus freely movable in all directions ; this is the form, then, having tried practically most of the others, that I can confidently recommend to you as the one which will give you most satisfaction.

13] METHODS OF EXAMINING UPPER AIR PASSAGES. 155

This finishes the description of our list of *essentials*. They are, to recapitulate: two mirrors—one laryngoscopic, one rhinoscopic—a forehead reflector and a good illumination—artificial reflected light being preferred—but, if you will allow me, I will now add one very useful instrument to this list, that is, a tongue spatula—an instrument whose use, instead of the commonly improvised means for depressing the tongue—above all, the omnipresent, domestic spoon—will save you much time and trouble. The spatula made on the model of Türk's fulfills two indications—its handle and shank are at one side of the mouth, out of your way, out of your light, while the blade, curved downward and corrugated, rests on the tongue and draws it forward, and is therefore to be preferred.

I now turn, without further delay, to the subject proper of to-day's lecture—the methods of investigating the upper passages through which the respiratory current passes—in other words, the mouth, pharynx, larynx, anterior nares, and posterior nares; and I shall convey to you, in as concise a manner as I can command, only what is absolutely essential for you to know, in order that you may, after some practice, conduct your manipulations understandingly, accurately, and skillfully.

The examination of the first two of these cavities, those of the mouth and pharynx, is usually readily performed; the patient need only be placed in a suitable light, the mouth widely opened, and the walls of the former may then be easily inspected, the lips alone needing to be turned upwards or downwards, as the case may be, in order to see their lining mucous membrane. To examine the pharynx, the tongue usually needs to be depressed, and the patient's position will vary somewhat as you use natural or artificial light; with the former it is only necessary that he should face a window through which the sunlight enters, its rays having the same direction as his open mouth, while for the latter he

should be seated by the side of a table, upon which the lamp stands that affords the illumination, and its rays are directed by the physician's forehead reflector, if this be used, into the mouth; or the lamp alone may be held close to his mouth, the examiner being protected from its glare by a suitable screen (the direct method). The respective advantages of these methods I have already alluded to, and need not repeat them here. In any case the tongue will need to be depressed if the posterior pharyngeal wall is to be thoroughly inspected, for the exceptions are so rare where this is not necessary that they only go to prove the rule. To do this the spatula should be laid gently upon the dorsum of the tongue, and slight pressure downwards be made upon that organ—not directly downwards, however, and not backwards, but forwards and downwards; that is, towards the examiner, for this procedure will draw the ascending portion of the base of the tongue and the epiglottis away from the posterior pharyngeal wall, and facilitate a view into the deeper parts of the pharynx. This pressure should be gentle; under it you will find even the most uncontrollable tongue sink quietly to the floor of the mouth, while, if the pressure be violent, the tongue will exercise a counter-pressure, arch itself upwards, cause the spatula to slip, and render a satisfactory examination impossible. Once in position the spatula should not be moved; if it be badly placed, remove and re-introduce it, but do not try to alter its position materially while in the mouth, especially in first examinations and with irritable patients, for retching will surely be provoked; and though this procedure is advised by some authors, and is said to increase very much in certain cases the extent of the view, it is certainly most disagreeable to the patient, also annoying to the physician, and so often prevents, when once established, any further operative procedures at the time, that it is to be carefully avoided. Gentle pressure, then, is well borne, and if the spatula

be kept from touching those points whose irritation causes retching—the palate and neighboring parts especially—the tongue can by its means be carried well down to the floor of the mouth, and kept from obstructing the view. This will vary greatly according to the natural configuration of the parts; in some the whole pharynx, even the tip of the epiglottis, can be readily seen, while in others, with a long velum and small pharynx, but little of the pharyngeal wall is visible. This velum modifies to varying degrees the extent of the view upwards, and it is well therefore to remember that if the patient breathe strongly through the widely opened mouth, that it will be drawn upwards and more of the pharyngeal wall rendered visible, while to examine it and the length of the uvula, often an important matter, this manner of breathing must be carefully avoided and the patient be directed to carry on respiration entirely through the nose.

To enter into a detailed description of all the parts presented to the eye by means of this examinative procedure is not necessary, and would be foreign to the purpose of the lecture. They are familiar to you all, and I therefore only call your attention to the fact that your inspection should inform you as to the general configuration of the parts, and to any deviations from the normal standard; to any limitation in the muscular movements of the velum, so common after diphtheria; to the presence of cicatrices, erosions, or ulcerations, often seen, and which are most valuable local indications of general specific trouble; to abnormalities of color, as seen in the anæmia of tubercular disease, itself alone often diagnostic; to the presence of single or groups of enlarged follicles, common in granular pharyngitis; to inflammatory tumefactions, the presence of neoplasms, and to abnormalities in the amount and character of the secretion—surely a most valuable list of results which may be obtained by means of this most simple procedure alone.

Other difficulties which may prevent or interfere with the examination are usually of no great moment, and are easily overcome. Children, for instance, often refuse to open their mouths when desired to do so. I know of no other way to deal with them than to hold the nose closed until the imperative desire to breathe causes them to open it, even slightly, when the spatula may be quickly introduced into the mouth. Great irritability of the parts which provoke nausea is sometimes met with, but practice, training, and swift and dexterous examinations will reassure the patient and permit of a satisfactory inspection being made, if not at the first sitting, certainly ere long.

Remember that practice makes perfect, and as you have in the mouth and pharynx cavities which often need frequent and careful examination, it is well not to slight even so simple a procedure as that of depressing the tongue, but to acquire dexterity by practice, familiarity with the appearances by careful observation, and both by pursuing a systematic method of examination.

Let us now turn our attention to the next step to be taken in the thorough exploration of the parts which we are considering ; that is, to the examination of the larynx, to the performance of laryngoscopy, and here we have at once a more difficult task before us—one which will, as I have said, require some study, but which is, with some application, readily learnt. I take it for granted that you have provided yourself with an argand gas burner, arranged upon a drop light, or upon a gas bracket projecting from the wall ; or that you have a student lamp, which is also an efficient source of illumination ; that you have arranged this light so that it will be upon a level with the mouth or ear of the patient whom you are about to examine, and upon his right side. How now are you to proceed to obtain a view of the interior of his laryngeal cavity ? Let me tell you. Your patient must be seated directly in front of you, upon a chair

which has been so arranged, in reference to the illuminating lamp, as to be convenient, with his head thrown slightly backwards, but still on a line with the axis of his body, and neither inclined to the right nor to the left—as a rule, a position which will place the lower border of the upper incisor teeth upon a plane which is horizontal with the base of the soft palate will be found a favorable one. A head-rest is unnecessary. The examiner now seats himself in front of the patient, takes the knees of the latter between his separated legs, and accommodates himself to his patient's height, so that he looks directly into his mouth, and is at a distance from it which corresponds to the requirements of the focal distance of the concave forehead reflector which he has fastened upon his head, and by means of which he proposes to throw an image of the gas flame used—that is, “the optic expression of the union of all the rays of light which it reflects”—into the larynx which he is about to examine. His mirror will, therefore, if it be one of about twelve inches focal distance, need to be within six inches of the patient's mouth, so as to throw its focal point upon the glottis, or about that level; that is, six inches within the mouth. Practice with his concave mirror will, however, soon lead him to fix these limits for himself, and he will learn that by increasing or diminishing the distance between himself and his patient, in given cases, that he will soon succeed in determining its particular focal distance, and in illuminating the larynx in a perfect manner. The patient now opens his mouth as widely as possible, extends his tongue with considerable muscular force, and after it has been covered with a napkin, the examiner grasps it firmly, but not roughly, between his thumb and forefinger of the left hand, the thumb being placed above, and the forefinger transversely below, pressure and traction being so made that the tongue is, as it were, rolled over the finger and raised off the incisor teeth. This is a small point, but it is one which

prevents the *frænum linguæ* being lacerated, the patient becoming disgusted, and the surgeon annoyed, and therefore deserves consideration. If the patient holds his own tongue—which he should be taught to do, as it is a necessary part of any operative or therapeutic procedure when both the examiner's hands are otherwise occupied—he must use his right hand when the operator uses his right to introduce the laryngeal mirror, and *vice versa*, in order that space may be afforded the latter in which to conduct his manipulations. All being now in readiness, and the patient breathing quietly and deeply, but without effort, the laryngeal mirror must be warmed, to prevent the expired breath of the patient condensing upon its surface and dimming it. This may most readily be done by holding it for a few seconds over the chimney of the lamp, just long enough for the slight film which can be seen to collect upon its surface, when brought in contact with the heat, to gather together in its center and disappear; just at this moment the glass is ready for use; but make it a rule never to introduce a mirror into a patient's mouth without having first tested its degree of heat upon the back of the other hand. Nothing is more unpleasantly startling to one than to have a hot mirror thrust into his fauces. The reflected light from the forehead mirror is now to be thrown into the patient's mouth, and kept steadily in one position. This procedure the beginner will find the most difficult part of the manipulation; at least, I have found it so with my students. He has so many things to remember—the position of his patient, of the mirror, the picture of the larynx and its various parts as he sees it, perhaps for the first time—that he is not to be blamed if his light does wander, and he suddenly, by some movement of his head, leaves the mouth in darkness. Practice will soon teach, however, that when the light has once been reflected into the mouth, and its brightest point lies, as it should, just at the base of the uvula, it can be kept steadily at

that point, and the exact focus caused to lie accurately, by slight movements, backwards or forwards, as the case may be, of his head. To catch the rays of light on his mirror in the first instance often gives him some difficulty; but a simple rule will make it an easy matter. Let him first place the mirror directly over his forehead, in the median line, then turn it so that it comes over the right eye, and its axis, before vertical, becomes horizontal; he should now be able to look directly forwards, with both eyes, the right through the perforation of his mirror, and then turning its face slowly towards the left, or, in other words, towards the lamp, which stands, as you remember, on the right side of the patient's head, he will invariably catch the rays of light from it, and find that the illuminated point will be thrown in the mirror's course, directly upon the patient's mouth. The laryngeal mirror, which should be held lightly by the thumb, fore and middle fingers of the right hand—though I will say at once that the physician should practice its introduction with both hands, so as to be equally perfect with either, as in all operative procedures he will need the right to introduce his instruments—is now carried quickly and unhesitatingly in a curved direction, with its reflecting surface downwards, from the corner of the mouth over the dorsum of the tongue, until it stands in front of the uvula. The configuration of the parts will now determine his next step. Should he be plainly able to see the uvula and lower border of the velum, as he can in the majority of cases, if the tongue has been well extended, he will take the uvula upon the back of his mirror, and press it gently upwards and backwards, while at the same time he raises his hand and rotates the glass slightly, so as to bring its handle close in the corner of the mouth, a movement which also alters the inclination of the mirror, and causes its face to stand more perpendicularly, or, in other words, in a proper position for viewing the larynx. If, on the other hand, he cannot

see these parts when he arrives with his mirror at the back of the mouth, the patient must be directed to phonate "e" or "eh," when the velum and uvula will be drawn upwards, and he can then readily pass his mirror beneath the latter, and carry it upwards and backwards. During either of these procedures he must be careful not to touch the tongue, or the palate and its arches; the former will tarnish the mirror, and contact with the latter is liable to produce retching; but pressure over the uvula, especially if it be firm and steady, is readily borne by the majority of individuals, even at the first examination. The hand with which he has introduced the mirror must remain at the side of the mouth, not in front of it, to interfere with the entering rays of light, and after the mirror is well placed in position, may find a point of support by resting the two unoccupied fingers upon the cheek of the patient. If the mirror has been introduced in the manner which I have described, it will be held at an angle of about 45° with the axis of the patient's body, and though the exact angle which it must form with the laryngeal aperture will vary somewhat, this will, in the majority of cases, be found the one that will give the best general view, and if the patient now phonate the vowel "e" forcibly—not an "a" or "ah," as we so often see recommended in the text-books—the whole interior of the larynx will be rendered plainly visible, and its parts may be carefully scanned by simply turning the face of the mirror slightly to one side or the other, or altering very little its inclination. The common mistake made by beginners, in carrying out this manipulation, is either not to advance the mirror far enough into the throat, to remain halting in front of the velum—a position from which it is impossible to see anything of the larynx—or to carry it in too deeply and press it against the pharyngeal wall, with its face looking directly forwards—a position which affords a good view, perhaps, of the base of the tongue, but not of the parts

which he desires to see, and which is very liable to provoke attempts at retching, an act which will cause a temporary congestion of the larynx, and may, therefore, lead to false conclusions regarding its condition. You are not to understand, however, that the posterior pharyngeal wall is never to be touched by the mirror ; on the contrary, its lower edge will often find a point of support by resting against it, and it is desirable that it should. Experience will soon teach you to discriminate the class of cases where this will be tolerated. The mirror should only remain a short time in position, especially if the patient be an untrained one. You will find it much more satisfactory to yourself, and comfortable for your patient, to make numerous short, rapid examinations, and add together, as it were, the results of each, than to tire out the patient in an attempt to make an exhaustive examination, to obtain all the details at one sitting. I may also remark, on this point, that an examination should never be hurried, if it can be helped ; that if it fail, withdraw the mirror and try again. Remember that the most awkward and irritable throat may be rendered tolerant by training and practice, together with patience and application on the part of the surgeon. Fraenkel's remark is true, " that the laryngoscopist must always appear to have an abundance of time, for he loses it by being hasty, and gains it only by being deliberate."

To return to the picture of the larynx, as it is seen in the mirror. Do not be confused by the elaborate explanations which are given in some of the text-books, of its apparent distortion. The principle of laryngoscopy is a simple one, is that the small mirror which we have placed in the back of the throat, at such an angle that it will project the rays of light which we have thrown upon it by means of our concave reflector into the cavity of the larynx, conveys back to our eye the image of its interior by the aid of the mirror, in the same way and by the same path that the light has entered. If you remember now that the plane of the

glottis is nearly horizontal—for our purposes we may consider it to be so—and forms, with the laryngeal mirror, as it is held in the fauces, an angle of about 45° , you will see that the image of this plane must appear almost perpendicular in the mirror; that is, it will be inverted in an antero-posterior direction, and those parts which in reality lie anteriorly, nearest to you as you sit in front of your patient, will appear above in the mirror and furthest from you, while those which lie posteriorly appear below and the nearest to you. In other words, we see the epiglottis in the upper part of our laryngeal mirror, the ary-epiglottic folds lower and on each side, and finally, the arytenoid cartilages below. There is absolutely no other change caused by the position of your mirror. Those parts which appear on the right side in the glass actually lie on that side, but you will at once see that that which corresponds to your right, as you sit in front of your patient, will be on his left, and *vice versa*. It is this simple point, I believe, that has caused so much misconception. Its appreciation, then, when you are brought face to face with your patient, and the recollection that you are looking at his larynx exactly as you would see it were you standing behind him and looking downwards and forwards into his throat, will save you much confusion.

The practical performance of laryngoscopy is, however, not always as easy a matter as would appear from what I have already said; for cases are sometimes met with which present obstacles to its perfect accomplishment by the means alone which I have described to you. Let us now enumerate these, and see how we may overcome them.

They are: 1. A short *frænum linguæ*.

2. An unmanageable tongue.

3. Irritability of the fauces.

4. Hypertrophy of the tonsils.

5. Elongation of the uvula.

6. An unfavorable position of the epiglottis.

23] METHODS OF EXAMINING UPPER AIR PASSAGES. 165

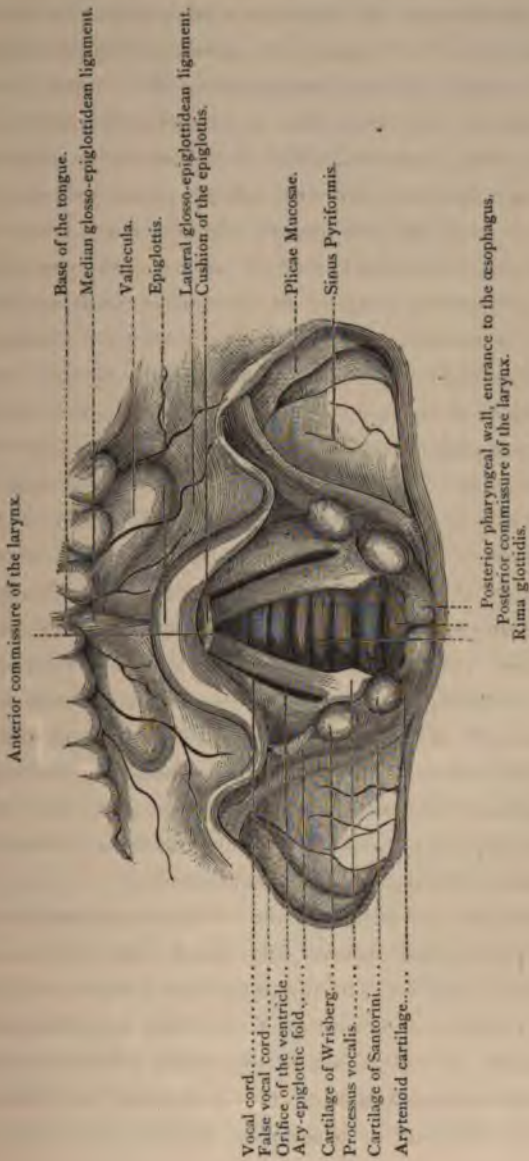
Patients are occasionally encountered, but only occasionally, in whom the *frænum linguæ* is so short that the tongue cannot be drawn out of the mouth over the incisor teeth. This is a decided disadvantage, for we are then compelled to examine them with the tongue lying on the floor of the mouth, and depressed, if necessary, by means of a spatula — a position which crowds its dorsum backwards, relaxes the glosso-epiglottidean ligaments, and depresses the epiglottis over the superior laryngeal cavity ; a good view of its interior is thus prevented. I know of no way of overcoming this difficulty, except by drawing the tongue as far forward as possible by means of the curved blade of the spatula, and causing the patient to phonate a high “e” as soon as the mirror is in position in the fauces; this will sometimes succeed, and give you a good view of the larynx.

The management of the tongue, especially in first examinations, can give you a good deal of trouble and annoyance. As soon as you are about to introduce the mirror the patient, involuntarily, or perhaps through apprehension of what is to follow, strains, contracts the muscles of the fauces, and arches up the dorsum of the tongue—so much so, in some instances, that your mirror is crowded up against the roof of the mouth, or, in any case, is soiled by the secretions of the cavity. This arching up of the tongue is also very frequent when the patient attempts to phonate the “e” which I have told you he should do, when you propose to view completely the interior of the laryngeal cavity. But in both instances, training, explanations to the patient of what you desire him to do, practice on his part, and your holding the tongue on a level with the mouth, not drawing it down towards the chin, will always overcome the difficulty.

A much more serious one, and one which it is more difficult to deal with, exists in the irritability of the fauces, met with in certain cases, but by no means as frequently as is commonly sup-

posed; for there are but few patients who cannot be satisfactorily examined at the first sitting, if the manipulations be properly conducted; and it is a very common thing for the operator to charge his failure to the irritability of his patient's throat, when it is probably due to his own lack of skilfulness in introducing his instrument. Cases are, however, sometimes met with where the irritability is great, and constitutes a real obstacle. I have met with very few, however, that could not be overcome by gentle manipulation and careful training of the patient, and they, as a rule, learn very readily to tolerate the pressure of the mirror against the velum, especially if that pressure be steady and firm; where this does not succeed the patient may be instructed to pass some instrument, a tooth-brush handle, for instance, a few times daily into his fauces until its sensibility is blunted, and the contact of a foreign body is borne without retching or spasmodic contraction of the parts. Personally I place but little reliance on the gargles, inhalations, sprays, and internal administration of drugs which are recommended for the purpose of overcoming this irritability. Bromide of potash or ammonium, locally, or in large doses internally, have been highly spoken of by some for causing an anæsthesia of the parts. Practically I have found them of little use. The sucking of small bits of ice for some moments previous to the examination is useful and efficacious, and I always employ this means, and successfully, in those rare cases where persistent and patient training will not effect its object.

Hypertrophy of the tonsils and a long relaxed uvula may present obstacles to the performance of laryngoscopy. In the first case an oval mirror must be used, which will pass between the tonsils, or a small, round one, which can be crowded past them and held in position in the fauces behind the tonsils. In the second case, a large mirror to hold up the parts—keep them out of the way, as it were—will be found all-sufficient.



The last difficulty with which we have to deal is harder to overcome than any of the preceding, and is, unfortunately, the one which is, perhaps, most commonly met with. I refer to an unfavorable position of the epiglottis—due either to the presence of an unusually large or pendant valve, or to a relaxation of the glosso-epiglottidean ligaments; in either case the same result is produced: the superior laryngeal opening is overhung by it, and the perfect illumination or examination of the larynx is thereby prevented. Such an epiglottis approaches very nearly the posterior pharyngeal wall, and is incapable of being elevated except by artificial means. The condition is one which is dependent upon a congenital conformation, being rarely met with as the result of accident or antecedent disease. Acute inflammatory conditions, it is true, may exist, and prevent its elevation for a time, but this class of cases does not concern us at this moment. To overcome the difficulty it will be only necessary, in the more favorable cases, to cause the patient to phonate the vowel “e” vigorously after the mirror has been introduced into the fauces—the tongue being meanwhile drawn forward to put the glosso epiglottidean ligaments on the stretch—and the observer will see the epiglottis rise up under his very eyes, and the whole laryngeal cavity come beautifully into view. An ironical laugh or a sudden inspiration, at the moment of the examination, will often accomplish the same result, by throwing the epiglottis upward for the moment. Should these means fail, and the epiglottis remain persistently depressed, as it sometimes will, you will have to resort to an instrumental procedure. A strong probe, covered with a gum-elastic coating, and bent at a suitable angle for entering the larynx—that is, one of about 120°—is carefully introduced over the edge and lanpegral face of the epiglottis—being guided by the reflection in your laryngeal mirror, and then traction made, to raise it gently but firmly. This procedure, after one or two trials, perhaps at the first, usually

succeeds well, and allows you to accomplish your inspection of the parts without further trouble. The other instruments—such as toothed forceps for grasping the epiglottis, needles and threads to pass through it, and serrefines to catch it—which have been from time to time devised, I do not allude to, because I believe their use to be unnecessary, and they only inflict injury on the epiglottis itself; the bougie will do all that is necessary.

Having learnt now, at least theoretically, *how* we see the picture of the larynx in the faucial mirror, let us turn our attention for a moment to *what* we see.

As your mirror is passed into the fauces, the first object which attracts your attention will be the base of the tongue, and next the epiglottis, from either side of which you see the pharyngo-epiglottic folds arching upwards and somewhat backwards, until they terminate in the posterior palatine arch; while between the first two lie the valleculæ, shallow depressions separated by the median glosso-epiglottidean ligament, and bounded laterally by lateral glosso-epiglottidean folds. The main point of interest in connection with them is, that foreign bodies often effect a lodgment at this point, and that certain pathological processes are prone to commence within their depths. Beneath their mucous membrane the body of the hyoid bone lies very superficially, and may usually be readily recognized by the presence of a yellowish-red protuberance. The epiglottis varies very much in its configuration and appearance in different individuals, in some its lingual face is most distinct, in others its laryngeal—in which case its cushion, so-called, will be seen as a bright red projection midway between its free edge and base. The cartilage may be long or short, small or large, and broad or narrow; its sides may approach each other so closely that a longitudinal fissure alone is presented to your view, or they may be so inverted posteriorly that they nearly touch, giving what is known as the “Omega” epiglottis;

further, its angle of inclination may vary anywhere from 40° to 60° , or even more, so that it nearly touches the posterior pharyngeal wall, and most effectually prevents any view of the laryngeal interior.

Your attention is specially called to these deviations in form, all of which are perfectly consistent with a normal epiglottis, in order that a mistaken diagnosis of distortion, displacement, etc., may not be made, as I have so often known it to be. Returning to our picture, we shall next see the aryteno-epiglottidean folds sloping backwards, downwards, and somewhat inwards, from the sides of the epiglottis, until they join the arytenoid cartilages on either side. You see that they are sharp, thin folds of mucous membrane, most prominent during the act of phonation, while during quiet respiration they are relaxed, and appear thicker and more irregular in outline; you also notice that they form the line of division between the larynx and the pharynx, limiting the former laterally, and go to make up a large part of the boundary of the vestibulum laryngis. Near the arytenoid cartilages a small rounded projection is noticed in these folds, which is due to the presence, at this point, of the cartilage of Wrisberg. A little beyond these, and in the same folds of mucous membrane, we meet with two other smaller projections, the cartilages of Santorini, which surmount the arytenoid cartilages, and between these latter, which are best seen when the vocal cords are approximated, as in phonation, and which are easily recognizable from their appearance, stretches the inter-arytenoid fold, or the posterior commissure of the larynx, a region of considerable pathological importance.

To the outer side of the ary-epiglottic folds—that is, between them and the walls of the thyroid cartilage—lies the sinus pyriformis, on either side, a triangular recess, lined with pharyngeal mucous membrane and rich in glandular tissue; it inclines downwards and backwards until it meets its fellow, behind the arytenoid

cartilages, and merges into the œsophagus at this point, the entrance of which is marked only by a transverse depression, which lies between the posterior portions of the larynx and the pharyngeal wall, which latter is seen above in the mirror as a smooth, reddish expanse. If we now look down the inner or laryngeal face of the ary-epiglottic folds we shall observe, about half an inch below their free, sharp border, a broad, reddish fold of mucous membrane, turned inwards upon itself, and stretching from the anterior commissure of the larynx—that is, the junction or angle of the wings of the thyroid cartilage—backwards, in more or less of a curved direction, to the anterior face of the arytenoid cartilage. This is the false vocal cord or ventricular band, and below it, and between it and the horizontal surface of the true vocal cord, which lies beneath it, is an oblong, dark opening which marks the mouth of the laryngeal ventricle. The true vocal cords, which come next in our picture, are easily recognizable, and form, as it were, a landmark. They are two pearly-white glistening bands, which pass, as you see, from the angle of the thyroid cartilage to the processus vocalis of the arytenoid cartilages; at the point where they join the latter you will observe a small yellowish mark, or depression, just on their free edges. This spot marks the presence of the fibro-cartilage of the processus vocalis, is termed the *macula flava*, and is not unfrequently diagnosticated as an ulcerated point by the laryngoscopic neophyte. The true vocal cords, as you will notice, form the anterior and greater part of the rima glottidis—posteriorly they are continuous with the inner triangular surface of each arytenoid cartilage; the glottis is therefore partly ligamentous and partly cartilaginous in its structure, the line of division between the two being marked by the *macula flava*, already alluded to. If we look now still deeper—that is, below the vocal cords—we see a broad yellowish band, the cricoid cartilage, and then a succession of small bands with

intermediate dark spaces, the tracheal rings, and sometimes, in patients with a large larynx and short, straight trachea, two dark, indistinct openings, divided by a sharp projecting ridge of a lighter color, will indicate that the bifurcation of the trachea has been reached by your eye.

What information shall we have now gained, if our examination of all these parts which I have described to you has been carefully made? The points are many, but I will allude only to those which are perhaps of the most importance—and here I must pre-suppose that your experience, gained from frequent inspections, has taught you to recognize at a glance a healthy organ; if this be so, any alterations from the normal standard, either in color or in the general appearance of the mucous membrane, will at once claim your attention. The color of the parts is all-important, and you will be oftener called to decide upon the degree of hyperæmia, or anæmia, than you will be to recognize the presence in the larynx of neoplasms, conditions of stenosis, or any of the rarer forms of lesion. It is therefore important that the normal appearance of the mucous membrane should be firmly fixed in your mind's eye. Other points which should be carefully looked after will at once suggest themselves to you; hypertrophy of the tissues is common in chronic laryngitis; erosions and ulcerations are present in many forms of laryngeal disease; pareses—varying in kind and degree—of the vocal cords are not unfrequent, and so on through a long list of pathological processes, which may affect the organ which we have just examined.

To ascertain the facts to which I have just called your attention it is not enough that you look quickly and carelessly into the laryngeal cavity; it must be carefully examined throughout, and in minute detail, special attention being paid to those parts which are only seen in profile, and where, consequently, abnormalities are most difficult of detection; it must be inspected when the act of

phonation is being carried out, the only way in which the entire superior surfaces and free edges of the vocal cords can be thoroughly seen, and which is the most satisfactory method of investigating their mobility and integrity. Furthermore and lastly, we should examine during the process of respiration, and especially during deep inspiration, when the widely opened glottis will permit of a view into the upper parts of the trachea.

The result of such an inspection, made by a trained hand and eye, will be accurate and trustworthy.

I now present for your consideration, before our hour comes to a close, a few hints as to the best manner of examining the last of the cavities which occupy our attention to-day. I allude to the anterior and posterior nares and the upper pharyngeal space, by the use of the rhinoscopic mirror. The inspection of the former—that is, the anterior nares—is easy of accomplishment ; but that of the latter, the most important as far as diagnostic results go, is difficult. This method of examination, then, is by no means as generally applicable as laryngoscopy, and is sometimes absolutely impossible of accomplishment. I mention this that you may not be disappointed when you fail, and in order that you may commence your attempts with a fund of patience that will last. Let this statement, however, not discourage you ; much can be accomplished by steady and persevering effort, even in the worst cases. For an inspection of the nasal passages from the front, we only need a good light—and here again the forehead reflector will be found to render the best service—and a suitable dilator for the alæ of the nose, although a fair examination of the parts may be made without it, by simply elevating the tip of the nose with the thumb, and dilating the nasal openings by pressure upon it. •Of these nasal specula there are many kinds, and some prefer one, some another. The two best, perhaps, are those known as Robert and Collin's speculum, a double-bladed affair, with a broad, trumpet-

shaped orifice, which is dilated and held open by means of a screw arrangement upon its side, and the wire speculum (half a dozen different names are attached to this one), somewhat similar to the dilator used by oculists for separating the lids. Both these are good, the first is a favorite one with me, but I not unfrequently use an ordinary ear speculum, especially with small children, and find it answers a good purpose. Thudicum's speculum is useful for operations on the anterior nares. With these simple means alone, then, you will be able to see all of the anterior nares that there is to be seen, without the use of further instrumental assistance, although many other aids have been devised, which will be found in practice more of a hindrance than a help.

The position of your patient and the light during your manipulations are about the same as those which I described to you as being the correct ones for laryngoscopy, excepting, of course, that the patient's mouth is held closed. If your speculum has now been carefully introduced, and the membrano-cartilaginous part of the nose widely dilated (be careful not to pass the speculum too high up into the narrow space between the cartilaginous septum and outer bony edge of the nostril, to cause pain), while at the same time a strong light has been thrown into the cavity from your reflector, you will see, more or less distinctly, the anterior, and parts of the inferior surfaces of the three turbinated bones, the side of the septum, and into the inferior meatus, your view of the two latter, in respect to the depth to which your eye reaches, depending entirely upon the natural formation of the parts, for it is exceedingly common to find a deflection of the septum to one side, usually the left, which narrows more or less the respective nares, occasionally occludes it, and prevents all view of the parts beyond; on the other hand, cases are met with in whom a very wide and roomy meatus permits you to look directly through it into the pharynx, and see the pharyngeal orifice of the Eustachian tube.

A careful inspection by this method, which should always precede or follow a posterior rhinoscopic examination, if a correct diagnosis of the condition of the nares is to be made, will instruct you as to the condition and color, pathological or otherwise, of the lining mucous membrane—any changes from the healthy condition being readily appreciated, after frequent examinations of the normal parts have been made—to the presence of hypertrophies, common in the chronic form of rhinitis ; to exostoses and cartilaginous tumors of the septum, not unfrequently met with ; to the presence of ulcerations or abnormalities of secretion ; and, finally, to changes from the natural formation of the passages.

For the performance of the posterior examination, to illuminate and convey to our eye the picture of the upper pharyngeal space, the posterior nares, and more or less of the posterior portions of the nasal passages themselves, we shall need : 1st, a tongue spatula ; 2d, a small mirror, bent at more or less of a right angle with its shaft ; and 3d, a good and sufficient source of light, to be used with the forehead reflector, and under the same conditions as I alluded to when speaking of laryngoscopy. All these instruments we have, and we now proceed to use them. The position of the patient, the position of his head, your position, and the direction and method of reflecting the light, are the same for rhinoscopy as I have described them to you to be for laryngoscopy, with two exceptions : First, that the focal point of the light is to be thrown lower down into the pharynx than is done for laryngoscopic purposes ; and second, that the patient, with widely opened mouth, instead of protruding his tongue, allows it to lie quietly behind the incisor teeth and depresses it well down upon the floor of the mouth with the spatula, in the manner to which I alluded in the last lecture. The rhinoscopic mirror is now to be carefully introduced from the corner of the mouth, with its reflecting surface upwards, carried over the tongue and under the velum, which

must hang motionless at one side or the other of the uvula, until it stands midway between the former and the posterior pharyngeal wall, touching neither, and at an angle of about 130° . In this position it will be impossible to get the whole picture of the parts at once, and the face of the mirror must therefore be turned from side to side to view the lateral pharyngeal walls, upwards to view the vault of the pharynx, and at more or less different angles and inclinations to see completely the parts embraced in the posterior opening of the nares ; indeed, it may have to be introduced upon one side of the uvula, especially if this be large, then withdrawn and re-introduced upon the other, if a perfect view of all the parts be desired.

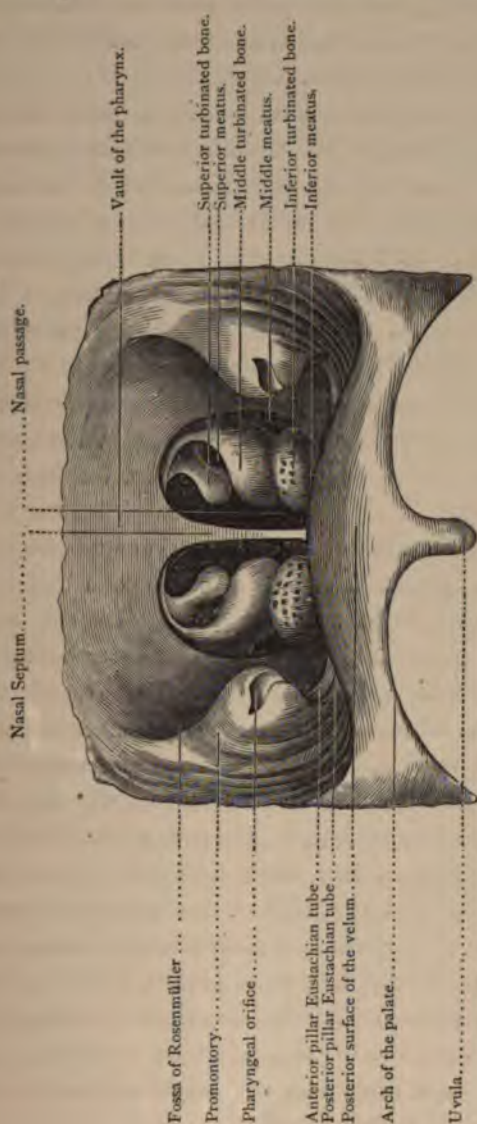
Such, then, is the method in an easy case, but three difficulties often present themselves which prevent its accomplishment—one is insuperable : a long hard palate, which approaches so nearly to the posterior pharyngeal wall that there is no practicable degree of space left through which an examination may be effected. A second is very common, and will require an additional instrumental procedure. This condition is one where a long, broad, soft palate, a long uvula, and a short distance between them and the posterior pharyngeal wall, coexist, and an examination can only be made when the former are drawn away from the latter. This is best accomplished by means of the palate hook, a hook of metal, broad and well curved where it passes under the velum, which is introduced by the left hand gently under the palate, and the latter drawn towards the operator with moderate force—that is, away from the posterior pharyngeal wall. I have never known this procedure to succeed perfectly at the first trial, but successive and persevering attempts will generally succeed in overcoming the spasmodic contraction of the palatine muscles which follows any attempt at first drawing the velum forwards. As a rule, however, you will find that the same time that is devoted to training a patient to tolerate

this hook, or any of the other forms of instrument which the inventive ingenuity of specialists has devised for the purpose—and they are many—will be all-sufficient to train him to breathe quietly through the nose and cause the palate to hang immovable in the mouth, and in a manner much more comfortable to him and less tiresome to you. The third and last difficulty to which I have alluded is met with in nearly all cases, but may fortunately be overcome by simple measures. This is the drawing up of the velum and uvula tightly against the pharyngeal wall, which occurs as soon as the patient opens the mouth widely, or as soon as your instruments are introduced within it; and when you remember that the position that we wish it to assume, the one that it must assume before your examination can be made, is precisely that which it takes when all muscular movement is in abeyance, and that the patient cannot assist you by carrying out any movements or phonating sounds, as he does in laryngoscopy, you will see the difficulty that presents itself. Quiet respiration carried on through the nose will overcome it, however, and this, which at first trial the patient will declare impossible to do, will after a few attempts be done, and the velum will be found not only to hang free from the pharyngeal wall, but to remain nearly motionless. Your examination may then be made with celerity, accuracy, and completeness.

The picture that you see is new and strange to you. You are looking at parts that are but rarely dissected, seldom thoroughly considered in our text-books, rarely correctly represented in drawings, and seldom, if ever, examined in the dead-house. To recognize all the various details, then, of the nares as seen from behind forwards, will require special care and study, and all the more so, as a complete view of all at once is rarely attainable. Your picture is made up of sections, as it were, obtained perhaps with difficulty, and seen in a small mirror. The drawing which I

have here will perhaps assist you in appreciating their appearances, and render their future recognition, after what I shall say about them, I trust, comparatively easy.

The first object which attracts your attention, as the rhinoscopic mirror is passed into position, is the posterior surface of the uvula, and next, the posterior surface of the velum, a broad reddish expanse which arches upwards so as to cut off from view more or less of the inferior portions of the nares proper, and thus hides the greater part, in most cases, of the posterior extremities of the inferior turbinated bones. The septum nasi now comes into view, and as it is the most easily recognizable of all the parts, it serves as a landmark or guide for the rhinoscopic picture, as the vocal cords do for that of the larynx. It is a thin, sharp ridge, whitish in color, and its sides are readily seen ; above it widens, becomes of a deeper color, and merges into the parts which go to make up the vault of the pharynx ; to either side of it are seen dark, ovoid openings, the posterior nares, and you will observe that they are more or less occupied by the three turbinated bones, bulbous bodies of a gray or ashy-red color, and that of them we see the middle one with part of the middle meatus of the nose most distinctly ; parts only of the superior and inferior bones are visible, the former appearing simply as a narrow projection from the outer wall of the nares, extending downwards, inwards, and backwards to lose itself behind the middle turbinated bone ; the inferior, which overlaps the middle one, and the upper portions of which alone are visible, appears as a rounded, hard tumor with an irregular and grayish-colored surface, much like a nasal polypus—for which it has more than once been mistaken. Of the meatuses of the nose the middle is, I have said, by far the most distinct, the upper appears only as a dark line, while the inferior is only occasionally seen. About the level of the inferior turbinated bones—further towards the sides of the picture, and



upon a different plane—we see on either side a rounded, smooth projection of a bright-red color, and between it and the outer limit of the posterior nares on the corresponding side a smooth yellowish expanse, over which a small vessel can sometimes be seen to course. This projection is continuous below, with two sharp elevated ridges, the anterior containing the fibres of the levator palati muscle, which pass downwards and inwards to the dorsum of the velum, where they are finally lost. They are the pillars of the pharyngeal orifice of the Eustachian tube, the triangular mouth of which lies between them, at the point where they leave the rounded projection above mentioned. If we follow this backwards we shall see that it defines a deep groove running upwards and outwards, and which lies between this lateral projection and the wall of the pharynx—in short, the fossa of Rosenmüller.

If the face of the mirror be now turned upwards the vault of the pharynx will be seen, its mucous membrane of a bright-red color, and its surface covered with irregular ridges and depressions. Lastly, a small opening, which may sometimes be seen a short distance below this point, on the posterior pharyngeal wall, marks the site of the mouth of the *bursa pharyngea* described by Luschka.

These points, then, having been seen, our examination is completed as far as the normal appearances go. The abnormalities of the parts, due to pathological processes, which may be detected by the rhinoscope, I have already briefly alluded to when speaking of anterior rhinoscopy, and need not recapitulate them. Our inspection of all the parts, from the anterior nares to the upper limit of the trachea, has now been accomplished, and if the process of examination has been conducted carefully and intelligently, we are certainly in a position to diagnosticate its conditions accurately, and to treat them successfully—no slight advantages in any case, as I am sure you will acknowledge.

In my description of the various processes by means of which these results are obtained, I am conscious of many sins of omission and commission; but the subject is a large one—one that might readily be extended over several lectures, more than our time will allow of—and my object has therefore been to present to you, as practitioners and students, not as specialists, as clearly and concisely as I am able, its practical points alone, and to show you how you can most quickly and most successfully attain the purpose you have in view. If, then, what I have said will serve you as a guide to the acquisition of a knowledge of the art of laryngoscopy, and the acquirement of practical skill in it, my design will have been accomplished.



ON TRACHEOTOMY AND LARYNGOTOMY.**BY****H. B. SANDS, M. D.,****Professor of Anatomy in the College of Physicians and Surgeons, and Surgeon to the Bellevue and Roosevelt Hospitals.**

FEW emergencies in practice so severely test the surgeon's knowledge and resources as those which demand an operation for the establishment of an artificial opening in either the larynx or the trachea. It will be my endeavor, in the present lecture, to set clearly before you the circumstances which call for such a procedure, the several operations which are presented for your choice, and the best mode of performing them—illustrating the subject, so far as I can, with facts derived from my own experience and observation.

The morbid conditions which may require these operations are various. The majority have their seat in the larynx, others in the trachea or bronchi, while a few are situated in the pharynx, or at some point external to the air passages. In many cases the operation does not admit of a moment's delay, and must be done with dispatch, as the saving of a life depends upon its immediate performance; in others it may be done with deliberation. In some the operation is easy and safe; in others it is extremely difficult, and attended with unavoidable danger to life. To render plain what I wish to say to you respecting the various conditions that may call for an artificial opening in the windpipe, I have collected them in the following tables:

TABLE A.—*Morbid Conditions of the Air Passages.*

- | | | |
|---------------|---|--|
| 1. Laryngitis | { | Œdematous,
Catarrhal,
Erysipelatous,
Croupous,
Diphtheritic,
Syphilitic,
Tubercular,
Exanthematous,
Traumatic. |
|---------------|---|--|
2. Foreign bodies in the air passages.
 3. Tumors in the larynx or trachea.
 4. Injuries of the larynx or trachea.
 5. Stenosis of the larynx after wounds or ulcers.
 6. Spasm or paralysis of the laryngeal muscles.

TABLE B.—*Morbid Conditions external to the Air Passages.*

1. Impaction of foreign bodies in the pharynx or œsophagus.
2. Tumors overlying the superior aperture of the larynx.
3. Cervical tumors or abscesses pressing on the trachea.
4. Thoracic aneurisms or other tumors causing pressure on the pneumogastric or recurrent laryngeal nerves.
5. Operations in the mouth or pharynx involving copious hemorrhage.

This arrangement is somewhat artificial, as there are certain cases that cannot be strictly confined to either group. I refer to instances of laryngeal paralysis or spasm, attended with the pressure of an aneurism or other tumor on one or both pneumogastric nerves. Nevertheless, the classification will be found convenient, and the enumeration, I think, tolerably complete. Let us briefly review the various morbid conditions I have set before you, and endeavor to define the indications presented by them for operative interference.

Beginning, then, with laryngitis, I remark that among its numerous forms none is more sudden in its occurrence or attended with more imminent danger than that which heads the list, and is called *œdematous*. Anatomically, it depends upon the presence of a dropsical effusion into the connective tissue beneath the mucous membrane lining the upper part of the larynx, and bounding its superior aperture. The connective tissue in these situations, especially that which lies within the aryteno-epiglottidean folds, is quite loose, and therefore liable to œdematous infiltration. At and below the level of the true vocal cords, the attachment of the mucous membrane is so intimate as to preclude the occurrence of œdema—a circumstance that must be regarded as fortunate, when we consider the naturally small size of the rima glottidis. I have adopted the name *œdematous laryngitis*, because I believe the œdema to be almost always inflammatory in its origin, and therefore unlike the passive dropsy that we so often meet with in the eyelids, the ankles, the external genitals, and some other parts of the body. An exception may be found, perhaps, in certain cases of aortic aneurism, in which pressure on the veins of the neck causes a mechanical œdema of the larynx; but the exception is a rare one, as I shall hereafter tell you. When laryngeal dyspnoea complicates aortic aneurism, it commonly depends on spasm of the laryngeal muscles, due to pressure upon the pneumogastric nerve. The term *œdema glottidis* is a misnomer, and should be rejected as implying an affection of the glottis, or rima glottidis, which is not involved in the disease.

Now, œdema of the larynx may be a primary affection, in which case it sometimes spreads rapidly, and exhibits many of the characters of erysipelas; from which it differs mainly in being confined to the connective tissue, whereas erysipelas attacks the mucous membrane itself. Sometimes it is due to traumatic causes. Thus, wounds of the larynx, or of its neighboring parts, operations for the

removal of tumors from the upper part of the neck, the mouth, or the pharynx, and scalds of the larynx, are occasional causes of this dangerous form of œdema. I know of an instance in which fatal œdema of the larynx was induced by the accidental contact with it of a stick of solid nitrate of silver. While the attending physician was engaged in applying this substance to the tonsils, the patient, an imbecile child, bit the physician's finger, causing him to relax his hold upon the caustic, which fell down upon the larynx. Sometimes the accession of the disease is very sudden. A few years ago, I was called in the night to see an old man who, only twelve hours previously, had had a portion of the inferior dental nerve excised for the relief of facial neuralgia, the operation having been done by trephining the inferior maxilla. When I arrived, I found the patient dying of suffocation; and although I lost no time in opening the larynx, the operation came too late. The side of the neck was much swollen, and after death I examined the larynx, and found it greatly œdematous. I learned that four hours before he died, the man was seen by the surgeon in attendance, who noticed the swelling of the neck, but no symptoms referable to the larynx. This form of œdema occasionally complicates other diseases, such as syphilitic and other chronic laryngeal affections, abscess of the tonsil, mercurial sore throat, and deep-seated cervical abscess. In whatever manner the disease originates the prominent symptom is dyspnœa, often coming on suddenly, and rapidly increasing in severity. In this kind of dyspnœa both inspiration and expiration are difficult, but the inspiratory act is most so, because, when it is performed, the swollen folds of mucous membrane which bound the sides of the laryngeal aperture are closely approximated, while during expiration they are pushed apart by the column of air that ascends.

But I would not have you trust to the rational symptoms alone,

as both by the sight and the touch you can render the diagnosis sure. If possible, then, examine the larynx with the laryngoscope, which will at once reveal the swelling that is so characteristic of this disease. Should the symptoms be urgent, or the patient unmanageable, or should the laryngoscope not be at hand, you can satisfactorily determine the state of affairs by introducing your index finger, which will readily detect the tumefied mucous membrane at the base of the epiglottis, and along the sides of the larynx. Having made this discovery, you should lose no time in affording relief, either by opening the windpipe, or by scarifying the œdematous tissues. The latter may be done with a probe-pointed bistoury, or a hernia knife, and sometimes this trifling operation is followed by the happiest results, the escape of the imprisoned fluid causing a rapid subsidence of the swelling, and a corresponding improvement in breathing. But in some cases of œdema, either because the effusion is more or less solid, or is situated in parts that are not readily accessible—such as the false vocal cords—or soon re-accumulates from the persistence of the original cause, the relief afforded by scarification may be temporary or inadequate; and in such circumstances the windpipe should be opened without delay.

Catarrhal laryngitis varies greatly in intensity in different cases. When slight it causes simple hoarseness, and does not interfere with respiration. But there is an acute and dangerous form of this disease, in which the symptoms are severe from the first, and in which there is generally considerable dysphagia, as well as dyspnoea. It is distinguished from croup and diphtheria by the absence of membranous exudation, and from œdematous laryngitis by general inflammation of the mucous membrane. The disease is often confined to the larynx, although it sometimes extends into the trachea. A majority of the cases recover under medical treatment, but the affection is often fatal—generally before the fifth

day. It has even proved fatal in the course of twelve hours. Death is always due to suffocation, the glottis being narrowed by the surrounding swollen tissues. Now, when the disorder does not yield to medical treatment, and the patient is threatened with asphyxia, the propriety of establishing an artificial opening below the seat of obstruction is unquestionable. In such cases the operation is often attended with the best results. Immediate and complete relief is afforded upon the introduction of the tube; and when the inflammation of the larynx subsides, the parts resume their normal appearance, air passes again through the natural channel, and the wound in the neck speedily closes after the removal of the tube.

Erysipelas sometimes spreads to the larynx, either from the head and face, or from the fauces. It is a rare, but extremely dangerous disorder, closely allied to certain forms of oedematous laryngitis, with which, indeed, it is often associated. It is attended with marked prostration of the vital powers, so that life is threatened both from asthenia and suffocation. To prevent death from the latter cause, tracheotomy or laryngotomy is invariably indicated when dyspnoea is urgent, although the prognosis is less favorable than when the operation is performed for catarrhal laryngitis. The local ravages of erysipelas of the larynx are occasionally very severe, suppuration and sloughing of the tissues being met with in the worst cases.

Another distressing variety of laryngitis is that which is sometimes associated with pulmonary consumption, the *tubercular*, and which is often denominated laryngeal phthisis. Generally, it coincides with extensive disease of the lungs; while in certain cases it may constitute the principal, if not the primary, affection. It depends upon the deposition of tubercle beneath the laryngeal mucous membrane, especially under that which lines the upper compartment of the larynx. At first, the parts are merely thickened

and swollen, but sooner or later the tissues are destroyed by ulceration, which, in bad cases, is both extensive and deep, causing necrosis of one or more of the cartilages, which may, perhaps, be discharged by expectoration. The ulceration frequently creeps outside of the larynx, and attacks the glosso-epiglottidean folds and the anterior surface of the epiglottis ; hence the pain which is so often experienced in deglutition. Now, in certain cases of this variety of laryngitis, the mucous membrane may be so tumefied from inflammatory products, or so elevated from œdematous effusion, as to cause dangerous stenosis, and this may be your warrant for surgical interference. Should the disease be chiefly laryngeal, the operation may not only afford temporary relief, but even promote a radical cure. But in any case it will remove the dyspnœa, —when this is laryngeal—diminish the pain in deglutition, and, while prolonging life, will render it more endurable. Let me caution you, however, against a grievous error. Do not mistake pulmonary for laryngeal dyspnœa, and perform the operation for a difficulty which it is powerless to remove. In a doubtful case, therefore, make a careful examination of the chest ; notice whether the breathing is simply short and rapid, as it usually is in the latter stages of pulmonary consumption, or whether it is noisy and labored, as if from laryngeal obstruction. Sometimes the laryngoscope will afford valuable information, but often the sensitiveness of the patient, or the abundant secretions of the diseased parts, will render an examination exceedingly difficult. In certain instances, extensive pulmonary and laryngeal disease may coincide ; and although you ought to exercise great caution before you decide to operate upon a patient far advanced in phthisis, you may sometimes greatly mitigate his suffering by insuring the easy access of air to the lungs. Only be sure that laryngeal obstruction actually exists, and that the dyspnœa is not simply owing to pulmonary disease.

Syphilitic laryngitis is by no means an uncommon affection. The larynx is liable to various lesions, both in the secondary and tertiary stages of syphilis; and the morbid processes, whether destructive, or consisting in the production of exuberant granulations or condylomata, are for the most part chronic, and can be controlled by suitable local and constitutional treatment. Occasionally, however, the larynx becomes dangerously obstructed from the presence of granulations or vegetations; and in such cases an artificial opening in the windpipe will be required to avert asphyxia. More frequently, however, the operation is demanded for the relief of the dyspnœa which, in cases of syphilitic affections of the larynx, accompanies an attack of acute inflammation of this organ. In many chronic disorders of the larynx, but especially in those that are of specific origin, acute inflammation is apt to supervene, thus greatly increasing the risk. Patients suffering from syphilitic ulcerations of the larynx, therefore, should be narrowly watched, and when the symptoms become suddenly aggravated, and the dyspnœa urgent, no time should be lost in inserting a tube below the point of obstruction. I know of no class of cases in which the operation more often saves life, or in which it is more imperatively demanded. Not only is the immediate peril averted, but the rest which is afforded to the diseased parts greatly favors the action of curative measures.

Traumatic laryngitis need not detain us, as it has already been alluded to when describing œdema of the larynx. It commonly occurs within a few days after the infliction of the wound, is rapid in its progress, and accompanied with considerable œdema. The timely performance of tracheotomy will often, in these cases, rescue the patient from suffocation.

Certain forms of laryngitis have been not inaptly named *exanthematous*, because they arise in the course of some one of the eruptive fevers. Scarlatina, smallpox, measles, and typhoid fever

—especially the two latter—are sometimes complicated with laryngeal inflammation. In certain instances, the characteristic eruption has been noticed on the laryngeal mucous membrane. With the exception of typhoid, the exanthematous forms of laryngitis are generally superficial, and when dangerous, become so from the supervention of œdema. But the laryngitis of typhoid, happily a rare disease, is severe and destructive, attended with ulceration, often deep-seated and extensive, and not unfrequently with necrosis of one or more of the laryngeal cartilages. In all forms of exanthematous laryngitis, tracheotomy is a resource in urgent cases; and, although the prognosis may not be very favorable, the operation often holds out the only chance of recovery.

Respecting the propriety of operating in the forms of laryngeal inflammation which I have hitherto considered, there is hardly any difference of opinion among surgeons, and the rule is generally imperative, to operate whenever the symptoms are such as threaten life. But in regard to the value of tracheotomy in the diseases known as membranous croup and diphtheria, there exists, even among those of large experience, the widest diversity of opinion and practice—some rejecting the operation as useless and injurious, while others advocate its performance in every case that is at all severe.

Now, I cannot hope entirely to reconcile these discrepancies. They indicate, to my mind, that the problem is difficult of solution, and that we do not possess the data that will enable us to reach a definite and satisfactory conclusion. It might be thought that the question could be settled by an appeal to statistics, but nothing could be more fallacious than such an opinion. Statistics in medicine are always liable to mislead, and especially when they are gathered from the experience of different persons, times, and places. The facts recorded differ from one another in so many important particulars, that it would be absurd to attempt a com-

parison of them. Thus, it has been frequently remarked, that those surgeons who operate often save a large proportion of their cases, while those who operate seldom save but few, if any. This difference in result cannot be explained by the relative skill of the operators, for this is in many instances unquestionable. The explanation generally given is, as I imagine, the true one. Those who operate very frequently doubtless perform the operation upon many patients who would recover without it, while those who decline to operate except in desperate cases will necessarily have bad results. Now, what value would attach to average conclusions drawn from the combined experience of these two sets of cases? Obviously, very little. And, in like manner, the varying fatality of different epidemics, the tendency of diphtheria to cause death by asthenia, and the reluctance of many surgeons to publish reports of cases in which the operation has been unsuccessful, are a few of the more important circumstances that vitiate the conclusions derived from the statistics of tracheotomy in diphtheria. While I refrain, therefore, from any attempt to settle this vexed question by an appeal to figures, let me tell you what I believe my own observation has taught me concerning the value of the operation, and the indications for its performance.

And, in the first place, I will remind you that diphtheritic croup, although generally, is not invariably, a fatal disease. In favorable cases, the membrane is either not extensive and copious enough to produce serious asphyxia, or it is removed by disintegration or expectoration, and the natural breathing is restored. Very rarely, even in what appeared to be hopeless cases, extensive tubular casts of the trachea and bronchi have been coughed up, and the patients have recovered. Unhappily, such an event is quite accidental, and we have no means of bringing it about. Nevertheless, the fact that spontaneous recovery from this disease is possible, must always constitute a powerful argument against the performance of trach-

eotomy in its early stages, especially as it is by no means certain to effect a cure.

In the next place, I am satisfied that the large majority of severe cases die, whether the operation has been performed or not. Asthenia, septicæmia, albuminuria, bronchitis, and pneumonia are among the most potent causes of death. That the operation is usually unsuccessful may be inferred from the fact, that several of the most eminent surgeons in New York, who have operated only in bad cases, have failed to save a single patient. A distinguished colleague, once a strenuous advocate for the operation, lately informed me that the last twenty operations he had performed had, without exception, proved fatal.

Holding these views, and with these facts before us, you will be surprised when I inform you that I believe tracheotomy to be warrantable, nay, even imperative, in many instances of diphtheritic croup. I regard it as an unfailing remedy, and as the only remedy, against *severe laryngeal dyspnœa*; and as fulfilling this indication, I always urge its performance when this symptom stands out prominently beyond the rest. Apart from its danger to life, this laryngeal dyspnœa is agonizing both to suffer and to witness; it has, moreover, a paroxysmal character, which is probably due to spasmodic contraction of the muscles of the larynx. Now, this urgent distress can be greatly relieved by tracheotomy; and it then rarely returns, even when the membrane continues to form in the trachea and bronchial tubes below. Whatever may be said against the operation as a means of cure, no one, I think, who has had any experience of it will deny that it greatly alleviates the patient's suffering, and prolongs, if it does not save, his life. In nearly every case in which I have operated, the relief has been wonderful; and I do not hesitate, therefore, to recommend the operation, although it can hold out no reasonable expectation of averting a fatal issue.

Yet, even as a life-saving measure it may be defended, for when tracheotomy is performed under the circumstances described, and the patient ultimately recovers, there can be little doubt that death would have taken place if the operation had been omitted. Many authentic examples have been recorded in which patients have been fairly snatched from the grave, they having got well after operations undertaken when they were apparently moribund. Again, it is sad to see a life lost for the want of an operation. I once witnessed the autopsy of a child that had died of membranous croup, and it was remarked that the disease had not extended below the level of the vocal cords. Similar examples have been recorded by others.

Nevertheless, I do not advise you to open the windpipe in every case of diphtheritic croup, for there are, as I think, certain contra-indications to the operation. When, in addition to severe laryngeal dyspnœa, there are other symptoms clearly pointing to a fatal termination, you should abstain from surgical interference. A copious deposit of false membrane in the throat, an exceedingly rapid and feeble pulse, marked nervous and muscular prostration, persistent vomiting, the presence of greatly swollen cervical glands, severe albuminuria, uræmia, or extensive broncho-pneumonia—one or more of these morbid conditions may cause you to reject the operation as useless. Many authors condemn tracheotomy on quite young children, yet I know of three successful operations performed in New York, during the past year, on children under three years of age.

My own experience of the operation is limited to seven cases. In all, death seemed imminent from laryngeal dyspnœa. Of the seven cases, only one, a child not quite three years of age, recovered. Of the remaining cases, one died a few minutes after the operation—which was undertaken when the patient was evidently moribund—while five lived for periods varying from ten

hours to as many days, their suffering having, in every instance, been greatly mitigated. Indeed, the relief afforded by the operation is often so marked, that unless you are careful, you will be misled into giving a favorable prognosis when there is really no ground for hope.

To sum up, then, I recommend the operation in all cases of diphtheritic croup in which laryngeal obstruction is the most prominent symptom, and in which the patient has sufficient strength to bear it. As a palliative measure it is one of undoubted value, and it occasionally saves a patient's life.

Passing now to the non-inflammatory morbid conditions of the air passages which render an operation necessary, I may mention the intrusion of a foreign body as one of the most urgent and important. Notwithstanding the fact that foreign bodies have occasionally escaped through the natural aperture of the larynx, it has been abundantly proved that such an event is comparatively rare, and that unless its escape is favored by tracheotomy, the foreign body may sooner or later cause death. Whenever you are convinced, therefore, that the accident referred to has occurred, and that the foreign substance is not of such a nature as to be softened or dissolved, you should perform the operation at the earliest moment possible. When the substance is arrested in the larynx, the life of the patient may depend upon an immediate resort to the knife. Some years ago, my friend Dr. Briddon presented to the New York Pathological Society the larynx of a boy who had died in a dentist's chair, after inhaling chloroform for the extraction of a tooth. During the administration of the anæsthetic the patient vomited, and then was suddenly seized with asphyxia, which after some minutes proved fatal. At the autopsy it was discovered that the rima glottidis was occupied by a piece of liver which the boy had eaten at breakfast, shortly before going to visit the dentist. The symptoms were ascribed

to chloroform, but, had they been correctly interpreted, a timely operation might have prevented the fatal result. Such a case may teach you two important practical lessons. First, you should endeavor to avoid allowing a patient to take any solid food on the day appointed for a surgical operation. Beef tea and milk will afford ample nourishment, and the risk of an accident like that described will not be incurred. Secondly, should severe dyspnœa occur suddenly during the administration of ether or chloroform, and especially after an attack of vomiting, you ought to perform laryngotomy immediately, for these symptoms would indicate, almost conclusively, that some foreign body had entered the larynx. When anæsthetics cause death, they generally prove fatal—as I have myself witnessed in two cases—by inducing syncope, the action of the heart and lungs ceasing simultaneously. Fatal asphyxia from an anæsthetic I have never known, and I imagine can hardly happen, if the usual precaution is observed, of preventing the tongue from falling back over the larynx. Patients who inhale ether too freely, and obtain too little atmospheric air, often become cyanosed, but they never exhibit those symptoms of severe dyspnœa to which I have alluded, and the occurrence of which ought at once to excite a suspicion that a foreign body has gained access to the larynx.

Usually, however, the intruding substance passes deeper than the larynx, and enters the trachea or one of the bronchi—most frequently the right. If small enough, it may find its way into one of the smaller tubes, from which there will be little probability of its escape, and where it will likely lead to the formation of an abscess. Coins and other similar objects often change their place from time to time, and a knowledge of their position is frequently afforded by auscultation. The subject of foreign bodies in the air passages is full of interest, but time does not allow me to dwell upon it. The indication for tracheotomy,

however, is clear, and often the convulsive cough, which occurs at the moment the windpipe is opened, causes the immediate extrusion of the offending substance. Should this fortunate event not then happen, it may yet take place at some future time, and you cannot be too gentle in exploring the trachea or bronchi with probes and forceps. Still, either one of these instruments may render indispensable service. I was once present when tracheotomy was performed by a medical friend upon an infant, which was thought to have a white bean lodged in the right bronchus. After the windpipe had been opened, the foreign body refused to escape, and the expedients of placing the little patient in the inverted position, and of exciting cough by irritating the larynx with a feather, proved unavailing. Auscultation and percussion pointed to collapse of the lung, and the bean, which had swollen since its intrusion, so completely filled the bronchus, that no air could be got behind it to expel it. Being asked to try a probe, I did so, selecting an ordinary silver probe with a slightly expanded extremity. I passed the instrument at first into the left bronchus, where it entered readily. I next attempted to introduce it into the right bronchus, but encountered an obstacle. Feeling assured that the obstruction was due to the presence of the bean, I used a little force, when the resistance suddenly ceased, and the probe advanced an inch or more. In so doing, it must have either perforated the foreign body, or passed between it and the mucous membrane lining the bronchus. In any case, when the probe was withdrawn, it dislodged the bean, which was at once expelled during an act of coughing. The child made a prompt recovery.

Foreign bodies have many times been extracted from the trachea or primary bronchi by means of forceps, an angular forceps being the best for this purpose. Again let me caution you against the indiscriminate use of this instrument, which is liable to seize the

living tissues, especially at the angle where the trachea bifurcates. Some surgeons condemn the employment of the forceps altogether, and in all cases trust to the final spontaneous expulsion of the foreign body. But this event may never happen, and I would rather advise you to resort to the forceps only when you are satisfied where the offending body lies, and that the instrument can be made to grasp it. You can sometimes ascertain its position with a silver probe, or with a small elastic urethral bougie, armed with a metallic tip. A few years ago I made the useful discovery that, in adults, the bifurcation of the trachea and the orifice of each primary bronchus could be reached by the forefinger, introduced through an ordinary tracheal wound. An inmate of St. Luke's Hospital, while wearing a hard rubber tracheotomy tube, met with a singular accident. The tube, which was screwed into the neck-plate, got detached, and fell into the trachea. Auscultation indicated that it had entered the right bronchus. My colleague, Dr. Buck, enlarged the opening already existing in the windpipe, and detected the foreign body by means of a metallic probe introduced into the right bronchus. But, as the probe passed through and beyond the tracheotomy tube, the precise situation of the latter was difficult to determine. An attempt was made to remove it by bending the end of the probe in the form of a hook. The instrument was inserted the distance of seven inches, and evidently came into contact with the foreign body, but failed to seize it when withdrawn. Having obtained Dr. Buck's permission to explore the trachea, I introduced my index finger, and without difficulty felt the tube as it lay in the right bronchus, projecting into the trachea. Dr. Buck confirmed what I had observed, and knowing then the exact situation of the tube, extracted it easily and safely with a forceps. Since that time I have repeatedly experimented upon the cadaver, and have found, that with my index finger passed through the tracheal wound, I

can invariably touch the angle at the tracheal bifurcation, and insert the tip a variable distance into the primary bronchi. It is needless to insist upon the advantages and safety of this digital method of exploration, whenever practicable. When desirable, the little finger can be passed upward into the larynx, so as to detect either a foreign body or a morbid growth.

Tumors in the larynx not infrequently cause so much embarrassment in breathing, that either laryngotomy or tracheotomy becomes imperative. The operation is almost uniformly successful in affording relief, and is often preliminary to the removal of the tumor by thyrotomy. Generally, in cases of laryngeal tumor, the windpipe can be easily opened ; but in rare instances, in which the morbid growth is not confined to the interior of the larynx, but involves the parts overlying the trachea, the operation may be difficult and formidable. I shall hereafter relate to you a case which, under these circumstances, terminated fatally.

Among the traumatic affections of the larynx requiring tracheotomy, fracture of the cartilages is, doubtless, the most common. The accident is a rare one, and results from great violence, such as that inflicted by a blow or a squeeze. Either the thyroid or the cricoid cartilage may be fractured ; and, if the fragments are much displaced, fatal dyspnoea may ensue ; or, without great displacement, spasm of the glottis, or extravasation of blood beneath the mucous membrane, may destroy life by suffocation. But few of these patients recover, and of these, the majority owe their recovery to the prompt performance of tracheotomy. Not every case of this form of injury demands an operation ; yet you should remember that danger is always on the side of delay, and therefore watch your patient narrowly, lest he be carried off by spasm of the glottis, oedema of the larynx, or in consequence of some sudden alteration in the position of the fragments.

Of traumatic inflammation of the larynx I have already spoken ; and also, incidentally, of obstruction depending on hemorrhagic extravasation. Emphysema of the larynx, and the imprisonment within it of partially detached portions of the laryngeal cartilages—as, for example, the arytenoid or the epiglottis—in certain cases of cut throat, may be mentioned as possible indications for operative interference.

Stenosis, or stricture of the larynx, is a somewhat rare morbid condition, and, when it exists, usually calls for the establishment of an artificial opening, although cases are recorded in which the strictured parts have been relieved by instruments introduced through the natural aperture of the larynx. Stenosis may follow the healing of an ulcer, generally syphilitic ; or it may have a traumatic origin. A common cause is a deep wound of the throat, attended with extensive division of the thyro-hyoidean membrane. Such wounds are most often self-inflicted, and are apt to be fatal. When the patient survives, the wound may contract, but fail to close ; and a fistulous opening remains in the median line of the neck, which communicates with the œsophagus and the trachea, and through which, perhaps, the patient has to be fed by the aid of a stomach tube. After a while, the contraction increases, so that the tube cannot be employed without causing dyspnœa ; or, dyspnœa may be directly due to the contraction of the laryngeal aperture. In either case an artificial opening should be made in the windpipe, as soon as the breathing becomes seriously impeded. In such circumstances I have operated with the result of giving complete and permanent relief.

Finally, in this connection, either bilateral spasm or bilateral paralysis of the intrinsic muscles of the larynx, may occasion dyspnœa, which will prove fatal unless relieved by laryngotomy or tracheotomy. Spasm of the adductor muscles often complicates other laryngeal affections, and I have already sufficiently described

this complication. But, it may arise in the course of tetanus, as in a case that occurred at the New York Hospital some time ago, or depend on irritation of the recurrent nerves from the pressure of an aneurismal or other tumor. Dr. George Johnson has lately pointed out the interesting fact, that the irritation of *one* vagus may occasion a bilateral affection of the larynx, either spasmodic or paralytic. In cases of dyspnœa, therefore, which are presumed to be dependent on aneurismal or other tumors, you must endeavor to ascertain to what extent, if at all, such dyspnœa has its seat in the larynx; for, as you are aware, dyspnœa, in these circumstances, is generally due to direct pressure upon the trachea, at, or near its bifurcation. In this latter case, an operation would certainly be useless, if not injurious; but, if the dyspnœa has its proximate seat in the larynx, an operation may be done with propriety and advantage. In these doubtful cases, you should be guided by both the rational and the physical symptoms. Spasm of the larynx is usually denoted by *paroxysmal* dyspnœa; paralysis of the vocal cords will be revealed by the laryngoscope; and auscultation, percussion, or palpation may enable you to infer to what extent the trachea is compressed by any existing tumor. It must be acknowledged, however, that an exact diagnosis is often difficult, and that when the symptoms are urgent, the surgeon will be strongly tempted to operate in cases that no operation can relieve. The annals of surgery contain the records of many cases of aortic and innominate aneurism, in which the windpipe has been opened by mistake, the symptoms having been attributed to supposed œdema of the larynx, or some other laryngeal affection, when they really depended on the direct pressure of the aneurism upon the trachea. In one of these cases, the surgeon, during the operation, discovered his error by accidentally thrusting his knife into the aneurismal sac. Such mistakes are happily rare, and nowadays, with our improved methods of diagnosis, and with the laryngo-

scope to aid us, we shall be held culpable if we do not avoid them.

The foregoing considerations lead us naturally to the study of the second table, in which I have grouped those morbid conditions situated external to the air passages, which sometimes render necessary the establishment of an artificial opening in the windpipe.

The arrest of a foreign body in the pharynx or œsophagus occasionally, although very rarely, affords an indication for laryngotomy or tracheotomy. Numerous cases are on record, in which fatal suffocation has resulted from the impaction of a mass of food—generally a piece of meat—in the pharynx, the upper orifice of the larynx having been thereby occluded. The proper treatment in such cases would of course be the removal of the extraneous substance through the mouth, either with the finger or with the forceps; but, should this means fail, the patient might be rescued by laryngotomy.

A case in point is related by Bäder.* A man who had laid a wager that he could eat an enormous quantity of food in a very short time, stopped in the midst of his performance, and showed signs of asphyxia. Bäder, who arrived promptly, found the patient nearly suffocated; and, obtaining a negative result from a digital examination of the pharynx, opened the trachea immediately, and established respiration. Shortly afterward, the patient brought up an enormous bolus of half-masticated food, which must have been impacted in the lower part of the pharynx. He ultimately recovered.

Other foreign bodies may be similarly arrested. Mr. Durham quotes the following instructive case from Habcot: "A lad, fearing to be robbed, attempted to swallow nine pistoles, wrapped up in a piece of linen. The packet could not pass the narrow part of the pharynx, and suffocation impended from its pressure.

* Schmidt's Jahrbücher, XCVII., p. 126.

The windpipe was opened, and the boy's life was saved. The pieces of gold were subsequently pushed on into the stomach, and were discharged from the anus eight or ten days afterwards." *

The superior aperture of the larynx may likewise be dangerously encroached upon by tumors, either benign or malignant, which grow from some neighboring part, such as the walls of the pharynx, the œsophagus, tongue, soft palate, or tonsils. In these cases, should the removal of the tumor be impracticable, life may often be prolonged by the performance of laryngotomy. Sometimes, the dyspnœa is paroxysmal, showing that besides interfering mechanically with respiration, these tumors are liable to cause spasm of the laryngeal muscles. Occasionally, bad symptoms occur unexpectedly. Within a few months, a patient at the Roosevelt Hospital, who was about to undergo an operation for the partial removal of a sarcomatous growth involving the base of the tongue and the pharynx, suddenly became asphyxiated while inhaling ether, and was only saved from speedy death by tracheotomy, which was performed by Dr. Weir, the attending surgeon.

A post-pharyngeal abscess may overhang the larynx, and occasion dyspnœa, but, in such a case, the proper treatment would be the evacuation of the abscess by a free incision.

A curious case is related by Weger, of Königsberg. † A laboring man had his tongue bitten by a viper. Within thirty-six hours from the time of the accident the tongue became enormously swollen, and so impeded respiration that the patient became livid, and finally ceased to breathe. He was resuscitated, however, after tracheotomy, and in nineteen days recovered completely.

The calibre of the trachea is occasionally diminished to a dangerous degree by the pressure of a morbid growth, or of an aneurism. I have seen such pressure effects due to bronchocele

* Holmes' System of Surgery, 2d ed., Vol. II., p. 5

† Casper's Wochenschrift. 1838. No. 42.

and to lympho-sarcoma of the cervical glands. These cases are but rarely benefited by tracheotomy, owing to the difficulty in opening the windpipe below the seat of obstruction. But, of course, the operation should always be performed, if it offers the slightest chance of success. In a case of dyspnœa due to the pressure of a bronchocele, the operation may not only prolong life, but afford a possible opportunity of radical cure by medical treatment ; yet, nearly all these, as well as the other cases included in this category, are well nigh hopeless, and the operation is at best only a temporary expedient. Moreover, you must be prepared for disappointment. An eminent surgeon recently told me that he once opened the trachea to relieve it from the pressure of a tumor. After he had done so, he discovered that the tumor reached lower in the neck than he had imagined, and his patient died quite unrelieved.

I need hardly add anything to what I have said elsewhere respecting the indications that are afforded for tracheotomy, by the existence of aneurismal or other tumors, which cause pressure on the recurrent or pneumogastric nerves ; yet, I cannot refrain from repeating the caution I then gave you against mistaking tracheal for laryngeal dyspnœa. I have several times known the windpipe needlessly opened in these circumstances—the patient dying either during the operation, or a few minutes after its completion.

Finally, tracheotomy is sometimes undertaken as a preliminary measure, when operations attended with copious hemorrhage are performed in the mouth or pharynx. It is well known, that in such cases, while the patient is insensible from chloroform or ether, blood is liable to be inhaled, or to flow down into the larynx ; and its presence in the lungs may be the cause either of immediately fatal asphyxia, or of subsequent bronchitis or pneumonia, likewise often fatal. In all operations, therefore, which are attended with this danger, measures should be taken to obviate

it. In some operations in the nasal cavities, it may be expedient to plug the posterior nares, as for epistaxis. But this will be of no avail in such operations as extirpation of the jaw, of the tongue, of naso-pharyngeal polypi, or of large tumors springing from the palate or tonsils. In all these instances, the hemorrhage is rapid and copious, and the risk of entry of blood into the trachea is great. Now, apart from tracheotomy, which I have never yet found it necessary to resort to in such circumstances, there are certain other precautions which may suffice, and by the observance of which I have many times removed the upper or the lower maxilla, naso-pharyngeal polypi, as well as tumors springing from the tonsils or the walls of the sphenomaxillary fossa, without any accident owing to the inhalation of blood. These are as follow: First, avoid unnecessary delay. I have known ten minutes spent in removing the superior maxilla, when three would have been ample. Meanwhile, much blood entered the pharynx, and probably, also, the trachea. Secondly, attend to position. The patient should be sitting rather than lying, and his head should be inclined forward, whenever practicable. Thirdly, avoid profound anæsthesia. In these operations, I rarely repeat the administration of ether or chloroform, and never carry it to complete narcosis. Sufficient insensibility is thereby induced to prevent acute pain, while the patient is yet conscious enough to resist the entrance of blood into the trachea. You may ascertain the value of these precautions by neglecting them. Perform the operation slowly, keep the patient on his back—in which case you will probably be compelled to draw his tongue forward—and let him be in a state of profound anæsthesia, and he will be quite likely to die on the table from asphyxia.

But, if, in any case, you deem these precautions insufficient, you can obtain further security against the accident referred to by opening the windpipe, and plugging either the pharynx or the

trachea, so as to prevent the blood from passing below the canula, through which, during the operation, the patient inhales the anæsthetic. Nussbaum,* in 1869, extirpated a large sarcomatous tumor of the superior maxilla; and, as a preliminary measure, he performed tracheotomy, and then covered the superior aperture of the larynx with an oiled linen compress. This, it is alleged, entirely prevented the entrance of blood into the air passages. Trendelenburg,† in 1871, invented the instrument called the tracheal tampon. It consists of a long tracheotomy-canula, the sides of which are surrounded by a delicate india-rubber bag, which can be inflated so as to completely fill the space between the tube and the mucous lining of the trachea. The instrument is ingenious, and, I believe, efficient, although somewhat troublesome to manage. If, in any case, you could not obtain it, the plan recommended by Nussbaum might deserve a trial.

Having thus pointed out as fully as time will permit, the various morbid conditions which call for the establishment of an artificial opening in the windpipe, I will now describe to you in what manner this end can be most safely and easily accomplished; premising, however, that the operation is often necessarily both difficult and dangerous.

Certain anatomical facts are so important that I must here recall them to your minds. In the adult male, several elevations and depressions are easily distinguishable through the unbroken integument, by running the finger along the median line of the neck. Thus, at the top of the larynx will be felt the notch between the alæ of the thyroid cartilage; next, the vertical ridge formed by the united alæ, the upper and most prominent part of which is called the *pomum Adami*; below this, a depression large enough to lodge the tip of the finger, corresponding with the

* *Bayerisches ärztliches Intelligenzblatt*. 1869. No. 47.

† *Archiv. für klinische Chirurgie*. Vol. XII., p. 121.

situation of the crico-thyroid membrane ; then, a prominence caused by the cricoid cartilage; and lastly, the trachea itself, which is more or less distinct in different subjects. These landmarks are much more easily recognized in males than in females, in the lean than in the fat, and in adults than in children. In many young subjects, with short, fat necks, they are almost indistinguishable. Beneath the integument, the windpipe is covered by the superficial and the deep cervical fascia, the sterno-hyoid and the sterno-thyroid muscles. The crico-thyroid artery passes almost transversely over the crico-thyroid membrane, to join the corresponding vessel of the opposite side. It is never very large, and, when divided, can be readily secured. The isthmus of the thyroid gland generally covers the second, third, and fourth tracheal rings. But it is liable to great variations in extent, and sometimes conceals the upper inch, or more, of the trachea. It also varies considerably in thickness and vascularity, so that when cut through or torn, it sometimes bleeds freely, and, at other times, only slightly. Below the thyroid gland, the trachea is covered with a plexus of large veins formed by the inferior thyroid veins, and their tributary and communicating branches. These veins are often quite numerous, and, when distended, as they are likely to be in cases demanding tracheotomy, oppose a formidable obstacle to the completion of the operation. Two transverse veins also usually exist, one joining the two anterior jugular veins near the sternum, and the other, the lateral lobes of the thyroid gland, just above the isthmus. The innominate artery crosses the trachea obliquely near the top of the sternum, and the left common carotid ascends close to the median line at the root of the neck. An anomalous artery, the thyroidea ima, sometimes lies in front of the trachea, and is therefore liable to be wounded, when it exists. It should not be forgotten that the windpipe is exceedingly movable, and therefore liable to get displaced during an operation,

and that it recedes from the surface as it descends, so that, while the larynx is quite superficial, the trachea at the level of the upper border of the sternum, is at least an inch behind the integument.

Now, there is no point on the surface I have described which is inaccessible to the surgeon's knife, but, there are three situations where the air tube is most often opened. In *laryngotomy*, the opening is made through the crico-thyroid membrane; in *tracheotomy*, through the rings of the trachea; and in *laryngo-tracheotomy*, through the crico-thyroid membrane, the cricoid cartilage, and one or two of the upper tracheal rings. All of these operations have been grouped under the generic term bronchotomy, which, as having no definite meaning, ought, I think, to become obsolete.

Viewed in the light of the anatomical facts I have thus briefly epitomized, laryngotomy is by far the simplest operation. The crico-thyroid membrane can always be easily reached; it is in relation with no important vessel, and generally affords—at least in the adult—ample room for the introduction of a tube. This latter fact has been denied, but can be made plain to any one who chooses to operate on the cadaver. Moreover, I have rarely encountered the least difficulty from this cause in the adult living subject, and have notes of several cases, in which patients upon whom I have performed laryngotomy have been able afterwards to wear a full-sized canula for months or years without discomfort. In young children the case is different, and a simple incision of the crico-thyroid membrane hardly gives space enough for the insertion of the canula. Another objection to this operation, in young children, is the uncertainty often experienced in entering the larynx, when, as is frequently the case, the mucous membrane is swollen, and overlaid by a thick diphtheritic deposit. The calibre is, in these circumstances, so much reduced, that laryngo-tracheotomy, or tracheotomy proper, becomes preferable. Want

of space is also an argument against laryngotomy, when an artificial opening is required to permit the escape of a foreign body, unless the latter be lodged in the larynx, when the crico-thyroid membrane, and also, if necessary, the thyroid cartilage itself, might require division.

Laryngotomy, then, is an operation which should be preferred to all others, when sufficient room can be obtained, and when the artificial opening in the windpipe is made for the relief of any obstruction or narrowing of the air passage that does not extend below the level of the true vocal cords. It is accordingly indicated in the various forms of laryngeal inflammation, with the exception of the croupous, and the diphtheritic; in many cases of laryngeal tumor; of stenosis following wounds or ulcers; of bilateral paralysis or spasm of the larynx; of foreign bodies impacted in the pharynx or œsophagus; and of tumors overlying the superior laryngeal aperture. On the other hand, it is contraindicated in infancy, in cases of foreign bodies in the trachea or bronchi, of croup and diphtheria, and of cervical tumors pressing upon the trachea. It is also inferior to tracheotomy when a preliminary operation is required to prevent the entry of blood into the air passages.

Laryngotomy may be best performed in the following manner. The tip of the index finger having marked the situation of the crico-thyroid membrane, the latter should be the centre of an incision about two inches long, made exactly in the median line. The skin and fasciæ having been divided, the sterno-hyoid muscles should be separated from each other, and held apart by retractors, when the crico-thyroid membrane will be satisfactorily exposed. This had better be divided by a narrow-bladed knife, close to the upper edge of the cricoid cartilage, and in a transverse direction. I prefer this to a vertical incision, which gapes less, and is more liable to wound the little crico-thyroid artery. Before

puncturing the membrane, it is well to steady the windpipe by a tenaculum, which should be implanted in the lower margin of the thyroid cartilage, and pulled upwards. After the opening has been made, the tube may be inserted at once, and generally enters without difficulty.

Should you be called upon unexpectedly to operate in a case of extreme urgency, you may perform laryngotomy in the adult almost instantaneously, without making a regular dissection. With a single stroke of a knife the larynx may be laid bare, and with another it may be penetrated, while the margins of the wound are held apart by the thumb and forefinger of the left hand. But, unless the danger from asphyxia be extreme, it will be better to act with deliberation.

The safety of administering anæsthetics in these operations is now generally admitted. As laryngotomy is an operation chiefly applicable to adults, an anæsthetic is not absolutely demanded; and, in cases of acute laryngitis, accompanied with urgent dyspnoea, I have frequently operated without one, the patient willingly submitting to the pain in the hope of obtaining speedy relief. There are some advantages in performing this operation without an anæsthetic, as the patient can then be seated in a chair, and the head can be readily extended. But, if he is unruly, an anæsthetic will be a great help.

In performing tracheotomy, especially in children, I almost invariably use ether, and I have never had cause to regret its employment. When asphyxia is present in any marked degree, the effect of the anæsthetic is speedily obtained, and in many instances the breathing is rendered easier, probably in consequence of a diminution of laryngeal spasm. In young children anæsthetics are indispensable. I am not prepared to allege that they are absolutely free from risk, but I am sure that any slight danger attending their employment is far outweighed by the safety and

precision which they ensure in the more difficult and delicate steps of the operation. Unless your patient is already insensible, therefore, or unless death seems imminent, I strongly urge you to administer an anæsthetic, as it greatly facilitates the operation.

Laryngo-tracheotomy resembles laryngotomy, from which it differs mainly in the extent of the deep incision, which involves, in addition to the crico-thyroid membrane, the cricoid cartilage, and that part of the trachea which is situated above the isthmus of the thyroid gland. The direction of the incision must here be vertical, and its extent proportioned to the age of the patient, and the circumstances in which the operation is performed. Thus, for the removal of a foreign body from the air passages, or for the insertion of a canula in a child under five years of age, the entire available space will be needed; while in the adult, should simple division of the crico-thyroid membrane not permit the easy introduction of a tube, ample room will be obtained by incising the cricoid cartilage, without dividing the rings of the trachea. It is always desirable to avoid unnecessary prolongation of the cut downwards, lest the thyroid gland be wounded, and give rise to annoying hemorrhage. It has been said, that in the adult, the wound in the cricoid cartilage cannot be made to gape sufficiently to allow the easy retention of a canula; but this objection is evidently theoretical. I once performed the operation of laryngo-tracheotomy upon a patient who, two years afterwards, was still wearing a full-sized tube without the least discomfort. In the case of young children this objection certainly cannot be urged; and in them the operation is highly praised by some surgeons, who perform it generally in preference to tracheotomy below the isthmus. I have tried it, but have failed to be impressed with its superiority. The larynx, being comparatively undeveloped in early life, is not so readily exposed as at a later period, and the narrow calibre of the upper portion of the air tube, often rendered

still smaller by disease, makes it difficult to effect a satisfactory opening. I have, therefore, in children, almost invariably performed tracheotomy just below the isthmus of the thyroid gland, and, as this is the operation most often applicable, I ask your careful attention to its various details.

As I have already intimated, an anæsthetic should almost always be administered. The patient should be placed in the recumbent position, with the head well extended, and turned neither to the right nor to the left. The extension of the head is of paramount importance; it must not be excessive, for then the breathing would be embarrassed, but it should be steadily maintained by some unyielding support placed behind the neck. A wine bottle is an excellent article for this purpose. The surgeon, standing on the right side of the patient, steadies the skin with the left hand, and makes an incision, exactly in the median line, beginning over the cricoid cartilage, and ending just above the sternum. This free external incision I think highly necessary for the satisfactory exposure of the trachea. After the skin has been divided, the anterior jugular veins often come into view, but can generally be avoided. Should they be joined together by a transverse branch, this may be divided, and, if necessary, tied. The operator next seeks for the interval between the opposite sterno-hyoid muscles, and separates them by the cautious application of the scalpel and director. The interval is usually marked by a faint, whitish line of connective tissue, and the recognition of this is desirable; otherwise the surgeon is liable to deviate from the median line, and to approach the side, instead of the front of the trachea. The muscles having been separated, are now held apart by small retractors, when the rings of the trachea can be indistinctly felt, and seen to be covered by some loose connective tissue surrounding the inferior thyroid veins, by the thyroid gland, to a variable extent, and in infants by the thymus. The latter, if present, can easily be

pulled downwards, but the main difficulty in laying bare the trachea arises from the presence of the thyroid veins, which, if large and numerous, are formidable obstacles. With care and coolness, however, they may usually be drawn aside, and this should always be done, when possible, in preference to cutting them. The connective tissue can be best divided piecemeal, between two tenaculum-forceps, which are made to seize and draw forward successive portions of it, along the median line. If the veins must be inevitably wounded, they should be tied, if possible, before they are divided. The trachea at last being fairly exposed, and the bleeding controlled, the surgeon places his left forefinger into the lower angle of the wound, so that the larger bloodvessels may be surely protected, and then, puncturing the trachea with a narrow bistoury, the back of which looks toward the sternum, cuts upwards as far as may be necessary, generally dividing about three of the tracheal rings. In this step of the operation the trachea must be hooked at its upper part with a tenaculum, and held steadily forward; otherwise, the incision will be dangerous and uncertain, owing to the great mobility and almost incessant movements of the air tube. A severe attack of coughing, accompanied with the expectoration of more or less bloody mucus, usually follows the deep incision. The operator then separates the margins of the tracheal wound, and, except when the operation is undertaken for the removal of a foreign body, introduces the canula, and fastens it in position by tapes passing around the neck. Many different methods have been recommended for the dilatation of the tracheal wound prior to the insertion of the canula, and special instruments have even been devised for this purpose. These are surely unnecessary. If you are short of assistants, you can effect dilatation by an ordinary dressing forceps, introduced closed, and afterwards opened. I have usually had the edges of the tracheal wound held apart with small hooks,

either blunt or sharp, and have never encountered any difficulty in the introduction of the canula.

I have not time to dwell upon the proper construction of the canula, although this matter is of some importance. The instrument should invariably be double, so that the inner tube can be removed and cleaned, without disturbing the outer one. The canula should be movable within the neck-plate, otherwise its inner extremity will be liable to cause ulceration of the trachea. This may also happen if the tube is too much curved, and such ulceration has been known to extend into the innominate artery, producing, of course, fatal hemorrhage. You should be provided with several instruments of different sizes, but it is never necessary to employ one large enough to distend the trachea. Canulae were formerly made of silver, but, on account of their cheapness, the hard-rubber instruments, made in Vienna, are now most frequently sold in our shops. They are very light, and are admirable in most respects, but have one marked defect. The canula being not very securely fastened to the neck-plate, may become detached while the patient is wearing it, and fall into the trachea. I have related to you such an accident that came under my own observation, and other similar cases have been recorded. In England, the "lobster-tail" canula, invented by Mr. Durham, is coming into use. It is expensive, however, and cannot yet be obtained at most of our shops.

I have described to you tracheotomy below the isthmus of the thyroid gland, but I ought to tell you that the operation is sometimes performed either above the isthmus, or behind it. The latter can be accomplished only by cutting or tearing through the gland. I have done this in a few cases with impunity, and know that it is not always dangerous, but I warn you not to meddle with the isthmus, if you can possibly avoid it. It is often wide, and exceedingly vascular, and in that case, when cut into, bleeds just like

erectile tissue. Many deaths, of which I have known more than one, have occurred from this cause, the fatal results having in some instances been due to loss of blood, and in others, to the escape of this fluid into the trachea. If suffocation is impending, you may be forced to cut through the gland, notwithstanding the risk, but, if possible, you should make tracheotomy a nearly bloodless operation. Roser advises the application of a ligature to the isthmus, on either side of the median line, previous to division. This practice seems objectionable, if the isthmus is broad, and unnecessary, if it is narrow. Still, the expedient may occasionally be useful.

Tracheotomy above the gland would, as a rule, be the best operation, if there were space enough to establish an opening of the requisite size. The air tube is here of wide calibre, and free from contact with large bloodvessels, arterial or venous. But you cannot expect to find more than one tracheal ring uncovered by the isthmus, which often, indeed, extends quite to the top of the trachea. The attempt to separate the gland by an ordinary dissection, and to depress it, would generally be unsuccessful, and lead to troublesome hemorrhage. Bose,* however, has recommended a method of dealing with the gland, which he affirms to be easy and safe. The thyroid body, with its bloodvessels, is enclosed in a fibrous capsule, which is pretty firmly attached to the trachea and the sides of the larynx. From the upper edge of the isthmus, this fascia extends over the larynx, to be closely connected with the thyroid cartilage. It has been named by Hueter the fascia laryngo-thyroidea, and its situation and attachments explain why it is so difficult to uncover the anterior surface of the trachea by pulling the isthmus downwards. Now, Bose has shown that if the fascia be divided by a transverse incision over the anterior convexity of the cricoid cartilage, a grooved director can readily

* Archiv für klinische Chirurgie. Vol. XIV., p. 137.

be insinuated behind it, so as to lift the isthmus from the trachea, and allow it to be depressed far enough to expose the three or four upper tracheal rings. Meanwhile, as the capsule of the gland remains unbroken, no serious hemorrhage can occur. Bose states that he has operated in this manner on nineteen patients—seventeen of whom were children—and that in all cases the operation was easy, and free from troublesome hemorrhage. I have no personal experience with this new method, but it strikes me as ingenious, and deserving of a trial. Should it prove to be practicable, it would doubtless have great advantages over tracheotomy below the isthmus.

A few instances are on record, in which tracheotomy above the isthmus has been the means of saving life, when threatened by the pressure of an enlarged thyroid gland below. In these cases, instead of an ordinary silver canula, a piece of elastic catheter, or a long india-rubber tube, must be passed below the point of obstruction. An example of complete success attending this method of treatment has been lately published.*

I have spoken incidentally of the difficulties and dangers of tracheotomy, but these merit a more careful consideration. In the first place, it is important throughout the operation that the incisions should be made exactly in the median line. A neglect of this rule may cause trouble in many ways. The trachea may be opened on the side, when difficulty will be encountered in retaining the canula, or, it may be missed altogether, and the dissection carried back to the spinal column. A lateral deviation of the knife may lead to serious hemorrhage. Near the sternum the carotid artery has been fatally wounded, and the innominate might be, although I am not aware that this accident has ever happened. Higher up in the neck, the lateral lobes of the thyroid gland may be injured, and copious bleeding result. Wound of the left inno-

* London Lancet, 1876. Vol. I., p. 171.

minate vein can hardly occur, unless the knife be carried behind the sternum. Indeed, except from carelessness or ignorance, an injury of the great vessels at the root of the neck is impossible, and will certainly never happen if the operator pushes them aside, by occasionally pressing his forefinger into the lower angle of the wound.

But, undoubtedly the greatest danger in tracheotomy arises from the division of the thyroid veins, or of the isthmus of the thyroid gland. I have told you to avoid cutting through the latter when possible, unless it is very narrow, and I have told you how to avoid injuring the veins. But, when they are large and numerous, and when you are operating on an unruly patient, with a short, fat neck, a wound of one or more of these veins is unavoidable. And, when you have wounded one, the blood that flows over the parts so far obscures them as to increase the chances of your wounding another. In these circumstances, the hemorrhage is often copious and persistent, and cannot be checked without much loss of time. A much debated question is whether you should wait until the bleeding has ceased, before you open the trachea. If asphyxia is impending, death may occur while you are engaged in checking the hemorrhage. On the other hand, if you open the windpipe while severe hemorrhage is going on, the blood may flow into the trachea, and destroy life very quickly. It often happens, that the venous bleeding, which before was alarmingly free, ceases almost immediately after the trachea has been opened, on account of the relief to the venous circulation which attends the re-establishment of respiration. This fact is undeniable, and has been verified in my own experience. But it is equally true, that until respiration is established, the danger from entry of blood into the trachea is exceedingly great; and I have seen impending suffocation made complete by the blood which passed into the trachea with the first inspiration that took place after it had been opened. Often, it

must be confessed, you will only be able to choose between evils, and if fatal asphyxia appears imminent, you ought certainly to open the trachea, notwithstanding the risk, which may be diminished by quickly inserting the canula, and turning the patient over on his face, so that the blood may not gravitate towards the opening. Unless the symptoms of asphyxia be urgent, however, I strongly advise you not to open the trachea until the hemorrhage has been controlled; and this I have generally succeeded in doing.

When blood has passed into the trachea, it is often immediately coughed up again; but, in some cases, life has been saved, either by suction of the wound with the mouth, or by aspiration of the trachea, by means of an elastic catheter, introduced through the wound. Roux was the first to adopt this practice, which has been followed by others, and extended by Hueter to the removal of diphtheritic exudations from the trachea and bronchi. I have no experience of the value of the method in the latter class of cases.

Sometimes, hemorrhage proves directly fatal, and a number of cases are recorded of deaths from this cause during the operation. Secondary hemorrhage is rare. In 1848, a patient at the New York Hospital was submitted to tracheotomy on account of syphilitic laryngitis. He was relieved of dyspnoea; but the bleeding, which had been free at the time of the operation, recurred during the following night, and proved fatal. The source of the hemorrhage was not discovered, but it was probably the thyroid gland.

A still rarer cause of danger attending a wound of the veins, is the entry of air into them during the operation. An unfortunate case of this kind once occurred in my own practice. In 1868, I performed tracheotomy upon a man who was nearly asphyxiated from an enormous malignant tumor, involving both the interior and the exterior of the larynx, and extending downward so as to cover a considerable portion of the trachea. The operation was performed without an anæsthetic, and was unusually difficult,

owing to want of space between the tumor and the sternum, and to condensation of the connective tissue which had been occasioned by a recent abscess. The wound being very deep, I was obliged to trust to the sense of touch rather than that of sight; and, while with my left forefinger in the lower part of the wound to protect the large vessels, I was endeavoring with the point of a scalpel to scratch through the areolar tissue in front of the trachea, a sharp hissing noise was heard, which every one present thought was due to the entrance of air into the windpipe through a narrow wound. Presently, this noise was repeated, and, suspecting its cause, I instantly opened the trachea by a free incision. But it was too late. The patient stretched out his arms, made a few convulsive movements with his face, and almost immediately expired. After death, the cause of the disaster was plainly revealed. The left inferior thyroid vein was found to be one-eighth of an inch in diameter; it crossed the trachea obliquely, and showed a slit-like wound, an inch and a quarter above its point of junction with the left innominate vein. It was imbedded in indurated connective tissue, and therefore had not collapsed when cut into, but readily admitted air, which was found in abundance in the pulmonary artery, and right cavities of the heart.

Much has been written respecting the difficulty of introducing the canula, but this step of the operation ought to be an easy one if properly managed; and, on this point, I have already given you rules that I hope are explicit. If, however, the trachea has not been opened to the requisite extent, or, if the margins of the incision be not duly separated, the canula may push the tracheal walls before it, and fail to enter. When the tube has really entered, air rushes through it at first with a loud noise, and it is hard to understand how such a mistake can occur as that of thrusting the canula into the connective tissue external to the trachea, and allowing the patient to die unrelieved. Yet, this error has

been committed, and is analogous to the blunder that is sometimes made in lateral lithotomy, of pushing the forceps between the bladder and the rectum, instead of entering the bladder itself. Sometimes, when the tube is removed, it is not successfully replaced. Many years ago, I performed laryngotomy on a very stout woman, who was suffering from acute laryngitis. The relief afforded was complete, but, on the following day, the attending physician removed the entire tube for the purpose of cleaning it; and, being unable to put it back again, lost his patient from asphyxia. Be careful, then, to see that the canula is securely fastened, and avoid removing the outer tube soon after the operation, unless you are sure you can replace it. After the lapse of some days, when the tissues around the opening have become consolidated by plastic deposit, the tube can be changed, if necessary, without difficulty.

In cases of diphtheritic croup, the canula, when introduced, occasionally strips the false membrane from the mucous lining of the trachea, and pushes it downwards into this tube. This is a very dangerous accident, and is most apt to occur when the opening has been made high up—where the windpipe is narrow—or not fairly into the trachea. In making the final incision, the knife may deviate from the median line, or, its point not being sufficiently sharp, penetrates the trachea only, and carries the false membrane before it. The occurrence of this accident is denoted by the absence of respiration through the canula, and by alarming asphyxia. No time should then be lost in removing the canula, and in endeavoring to clear the trachea by dilating the opening, and seizing the obstructing membrane with the forceps. If this be impracticable, another opening should be freely made below the first one, when respiration will probably be re-established.

In any case, when, after inserting the tube, air fails to pass through it, you must at once endeavor to find out th

cause of the obstruction. Some years ago, while making my rounds in the Bellevue Hospital, I found a patient with impending suffocation from syphilitic laryngitis. The house-physician, under my direction, performed laryngotomy, and inserted a canula; but, as the symptoms were thereby aggravated, and the patient seemed likely to die on the spot, I extended the incision rapidly through the cricoid cartilage, and the upper tracheal rings, and re-inserted the canula, whereupon the patient breathed freely. Being curious to ascertain why the first incision had failed, I introduced my finger into the larynx, and found it almost completely filled with soft granulations, which had evidently been the cause of our embarrassment.

You ought to be aware, that alarming asphyxia is not infrequently excited by the operation itself, which, probably, in such cases, provokes laryngeal spasm. Your duty will then be to terminate the operation with the least possible delay. Finally, you should never fail to open the windpipe, merely because asphyxia is far advanced. I once saw laryngotomy performed upon a patient with syphilitic laryngitis, who was, apparently, dead. She was resuscitated, however, and recovered completely.

Time will not permit me to say more than a few words in regard to the important subject of after-treatment. If a canula is inserted, care must be taken to keep it free from obstruction. This, in cases of diphtheria, is no easy matter, as the tube becomes rapidly plugged with mucus, or with shreds and masses of false membrane. These substances, unless removed, speedily cause suffocation, and must be got rid of either by passing a sponge or a feather through the inner tube, or by repeatedly withdrawing the latter and washing it. In rare instances, a dangerous accumulation takes place below the tube. This must be removed, if possible, by delicate curved forceps, introduced through the canula. Should this method fail, it will be necessary to take out the entire

tube, and effect extraction by means of an angular polypus-forceps inserted through the tracheal wound. These manipulations are stoutly resisted by the patient, and occasion considerable cough and nervous excitement, which, however, quickly subside after the operation is over, and the tube replaced.

Another important rule is to remove the canula, and re-establish natural respiration, at the earliest practicable moment. Much trouble is sometimes encountered in effecting this object, even when the original cause of obstruction has disappeared. The difficulty may be due either to the presence of exuberant granulations around the canula, to irregularity in the respiratory movements of the larynx, or to adhesion of the margins of the rima glottidis, the result of previous ulceration.* Adhesions should be prevented, if possible, by probing or dilating the larynx; granulations may be destroyed by repeated applications of lunar caustic; while the irregular action of the laryngeal muscles rarely offers more than a temporary obstacle to the removal of the tube.

I would gladly enlarge upon this topic, but want of time forbids, and I must be contented with expressing the hope, that what I have said will aid you in the work of preparation for meeting successfully some of the most trying emergencies that are likely to arise in your surgical practice.

* Thomas Smith. *Med. Chir. Trans.*, 1865, p. 227.

THE HYPERTROPHIED PROSTATE.

BY

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GENTLEMEN :—The subject to which I wish to invite your attention to-day, although it has been treated again and again by the most skillful surgeons, is one of such importance in reference to the direct prolongation of life, that I cannot refrain from dwelling on it once more, hoping thus to give a fastening blow to the information already imparted by others abler than myself. You may understand at a glance wherein you may contribute to the quota of years allotted to man, by considering that in this city of New York, during the past year, there died fifteen hundred and four men past sixty, of whom one hundred and seventy-three died from urinary difficulties. The data furnished by the Board of Health also tell us that these diseases are, next to cerebral and thoracic lesions, the most common of all the causes of death in such persons. Of these one hundred and seventy-three deaths, forty-one and probably more, were from prostatic diseases. Yet so high an authority as Sir Henry Thompson also informs us that those affected with senile hypertrophy of the prostate, *properly treated*, live equally as long as those who are not thus affected.

What is this hypertrophy, how does it act, and how can we attain such desirable results? These will be the points for us to study during the coming hour. The answer to the first question is, that it is an enlargement of the prostate, which begins generally about

the fifty-fifth year of a man's life—a time, however, postponed by Iversen and some others to the sixtieth year; and occurs in about one out of every three men, though, fortunately, only about one in every six persons is likely to have serious consequences therefrom. If the age of sixty-five is reached without the occurrence of hypertrophy, we are advised that the tendency to such formation will, in all probability, have passed by.

In order to clearly comprehend the changes that ensue from hypertrophy of this gland, I must ask you to examine carefully the thin transverse sections of a frozen prostate that are now being passed around the class. You will there notice not only the position of the urethra, a little below the centre of the gland, and the shape of the gland surrounding it, but also the situation of the ejaculatory ducts, from the point of their entrance into the gland at its posterior border, some three or four lines below the mouth of the bladder, to their opening into the urethra. You will observe, too, how rapidly they approximate each other, and that soon they run nearly parallel in their upward course to the urethra. It is this small portion of the prostate, located between these ducts and the urethra, which resembles, posteriorly, a band or commissure joining together the lateral lobes, and which was formerly described as the median lobe, but now, more correctly, as the median portion of the prostate—it is this portion, I say, that is of special interest to us in the consideration of our subject. For, although the enlargement of the gland may and does present itself in the other parts, as in the lateral portions or lobes, yet here, in this little triangular portion, especially rich in the glandular elements, it is, that any enlargement, by projection upward into the bladder, is apt to become pedunculated, and, by its growth from below, to change the shape of the vesical orifice, and, eventually, so to rest against and in it, that when muscular tension in urination is present to a sufficient degree, it fills completely this outlet, and checks totally the exit of urine. These diagrams, from Socin's work on

the Diseases of the Prostate, show this change very distinctly. When this hypertrophy is situated in the other portions of the gland, the anterior portion being rarely affected, the bulging forward of the walls of the urethra may so distort that canal as to lengthen it, with more or less abrupt curvations, from its normal one and a quarter inches to three inches, or to narrow it in places, or, to dilate it to form a pouch large enough to hold several ounces of urine. If this jutting forward of the urethral walls takes place coincident with the enlargement of the median portion, the channel for the urine may be made Y-shaped, the arms being formed by the bladder walls and the median hypertrophy.

Sometimes, with all this enlargement, there may be no perceptible increase in size to be felt by the finger in the rectum. On the other hand, the projection into the intestine may be decided, with but little coincident urinary obstruction. The amount of enlargement may vary, too, from the slightest increase in the median portion, as seen in this specimen, where it effectually barred the outgo of urine, to the size of a cocoanut, which caused no impediment whatever.

A moment's reflection will show you how such changes can affect the bladder's proper function. As soon as the growths reach a size sufficient to be forced against each other or against the sides of the urethra or the vesical orifice by the contraction of the bladder in micturition, trouble begins.

First, the muscular fibres called upon for greater effort, hypertrophy—then become stretched, thinned, and finally atonied. From such endeavors not only do we find these muscular fibres standing out beyond their usual level and crossing each other in a variety of directions, and lifting up thus the mucous coat into ridges, but in the interstices between these rugæ the mucous membrane is often forced by the hydraulic pressure into numerous hernial pouches of different sizes which jut into the peritoneal cavity, generating thus what is known as a rugose and sacculated

condition of the bladder. This same pressure, as in other obstructive diseases of the urinary outlets, is exerted in a more dangerous direction; the ureters become dilated even up to the kidney, and the pelvis of the latter is also similarly affected; and in advanced cases, thinning of the cortical substance of this organ often takes place, and at times total conversion of a kidney into one or more purulent cysts results.

And this is not the only direct way in which mischief may be produced. From the general enlargement of the gland, the circulation of the bladder is interfered with by the pressure upon the prostatic plexus of veins, situated, as you recollect, between the gland and its investing fascia. From this cause a congestion of the vesical coats ensues, which shows itself by reaction upon the numerous ganglia of the sympathetic, so intimately connected with the vessels of the mucous membrane, sometimes as a simple irritability of the muscular coat, without any signs of an altered urine being present. From this surcharged mucous coat generally a hypersecretion, or rather a malsecretion of mucus comes, to which is to be added that which is produced by the irritation of unhealthy urine, furnishing thus a double source of the agent by whose presence, according to the ordinarily accepted view, the decomposition of urine is brought about.

This decomposition, not to weary you, virtually changes the urine, an acid fluid, into an alkaline one, with the deposition of the earthy salts and the giving off of carbonate of ammonia from the disintegrated urea. Each of these abnormal products acts as an irritant to a highly vascularized mucous membrane, and the evils once started, as it were, are aggravated itself. Such a transformation we know from the recent researches of Mr. Vandyke Carter on the nature of calcium, are most amenable to the formation of stone in the bladder. Mr. Carter has shown that calcium carbonate is not essential to the formation of stones as was formerly supposed, or in the kidney, and how we have this confirmed by the experiments of A.

fusible or mixed phosphatic calculus is, therefore, legitimately one of the consequences of an hypertrophied prostate.

The pressure exerted by the irritated bladder on the enlarged prostate itself must not be overlooked, and the effects of the extension of inflammation to the substance of the gland must be duly considered. From these causes not only pain simulating stone, but epididymitis by extension along the ejaculatory ducts, with ulcerations and abscesses of the prostate, are not infrequently met with in the progress of such cases. Some of these complications are, however, due to other causes that will be hereafter alluded to.

In the beautiful specimen that I now show you, the series of changes that are met with in a typical case are clearly exhibited. The enlargement is seen to involve not only the lateral lobes, but also the median portion; the bladder is enlarged to a great degree, its walls thinned and rugose, and the mucous membrane not only sacculated but hypertrophied in places into numerous tufts of a villous character. When first opened there was seen about the urethral opening a pretty complete circle of branching, and irregularly dilated vessels. It is from the rupture of such vessels as well as from laceration of these vascular villous tufts that hemorrhage often results. Besides the great dilatation of the ureters and of the pelves of the kidneys, you will notice in one of these latter the thinning of the cortical substance and the many vacuities that have been formed by minute abscesses. But the ecchymotic patches visible at the post-mortem examination are unfortunately no longer present. In the field of the portable microscope now passing around, you will perceive in a section made from this kidney, that immediately external to the tubules one or more layers of pus cells are distinctly to be seen. This, with the dilatation of the straight portions of the renal tubules, and the thromboses of the associated veins, constitutes the principal pathological condition met with in the so-called surgical kidney—more

properly interstitial suppurative nephritis—the most common termination of chronic cystitis of whatever origin.

In the pelvis of the other kidney is a large irregularly shaped phosphatic calculus, which has originated here in the same way as it does in the bladder.

In the other specimens different varieties of prostatic enlargement are shown, some with the hypertrophy confined to the median portion and slight in amount. There is one, however, to which I would particularly ask your attention. It has a stone of considerable size in it, which was not recognized during life for the reason that it did not give rise to the painful symptoms usually associated with vesical calculus. A little explanation will make clear to you how this is possible. When the bladder is atonied its walls cannot be forced so strongly upon the calculus, and moreover, from the elevation of the mouth of the bladder by the upward growth of the prostate, the stone rests in the correspondingly depressed *bas-fond* and no longer impinges on the sensitive trigone even when the atony is not marked. Again, in the same specimen, you have demonstrated most happily to you what is sometimes described as the bar at the neck of the bladder. Here you see that it is the lateral lobes which have enlarged, and as they rise into the bladder they stretch and pull upward a fold of tissue between them. Just back of this is another fold extending between the mouths of the ureters, which is in fact a muscular hypertrophy. This condition was at one time the subject of a lively discussion, and special means were devised, particularly by the French surgeons, for its detection and division. I only allude to it that you may understand what is meant by the term, for the condition itself is not only rare, but does not require any special treatment.

Now, how are you to recognize this hypertrophied condition of the prostate?

The *symptoms* presented by the patient in a mild case are but

few, and consist mainly of frequent micturition, more troublesome at night than in the daytime. Why this is so I cannot satisfactorily tell you. Awakening thus to urinate, perhaps once or twice, does not annoy the patient, and it is only when the greater repetition of this act interferes with sleep that he deems it advisable to seek advice of his physician. Perhaps you may elicit by your questions the additional facts that the urine is expelled with less force and promptness than formerly, and that if he cannot relieve himself at once when the desire to urinate comes on, considerable pain is felt in the bladder. Other vague pains in the perineum, hips, and feet are often complained of; and in one case, where the cystitis became aggravated to a certain degree, aching pain was experienced in the tips of the fingers of the right hand, something like the famous case of Lord Cavendish's father, whose calculus caused pain, you remember, in his left arm.

The urine may at this stage of the disease be nearly or quite unchanged. An extra amount of mucus and microscopically a few pus globules show the only departure from the normal standard.

In these glasses you can see the urine which has lately been removed from several cases of hypertrophied prostate. The specimens present all shades of turbidity up to complete ammoniacal and fetid decomposition. In the last one, the action of the ammonia on the pus is shown by the deposit of ropy muco-pus, which as I invert the glass does not fall out. Your noses, however, will not be as thoroughly educated by this exhibition as your eyes, as a few grains of chloral hydrate have been added to each specimen to prevent further decomposition.

The set of symptoms just portrayed may vary with the duration of the disease, or may be suddenly changed for the worse by conditions that bring about prostatic congestion. With these you, possibly, are already familiar; they are, briefly, exposure to cold, undue venereal excitement, jolting exercises, high living, malarial depression perhaps, and, in truth, almost anything that turns the

scale of health may, either directly or indirectly, tumble upon the already impaired prostate a load too heavy to be borne. Additional swelling comes on in consequence, with additional difficulty in urination, and very often the first medical assistance ever called for by the patient for his urinary difficulty will be for relief from an attack of retention of urine.

In the more chronic form, other and more misleading symptoms are met with ; and here more acumen on the part of the surgeon is required. The frequency of micturition has probably increased with time, the urine is more changed, is "stronger smelling," they will tell you, and has a slimy sediment when left in the *pôt de chambre*. This tenacious muco-pus commonly indicates a chronic cystitis of generally a severe grade. The force of the stream is now very much lessened, and dribbling is greater. You do not always need the patient to tell you of this, for, unless he is particularly careful or wears a urinal, a penetrating urinous odor will reveal this symptom to a trained nostril. During sleep, involuntary leakage will sometimes occur. He grows paler and more delicate than he used to be, his flesh is not so firm, and he confesses to increased thirst and slight feverishness, with, every now and then, chilliness, or even a pronounced chill. These have been explained not only by the interruptions experienced in sleeping, but also by the absorption of the decomposing urine, for the bladder, according to Susini and Alling, does absorb, but only when inflamed, and when the epithelium has been impaired or destroyed. These otherwise slight ailments often produce a temporary aggravation of the bladder symptoms, tinging the urine with blood, and sometimes causing, to the patient's great alarm, a discharge of pure blood in the last moment of micturition. If he urinates in your presence, you will notice that it requires more of an expulsive effort than in the younger patient. This one will be more apt to lean forward and strain with a strong expiratory endeavor, which is felt as well in the rectum as in the bladder, and

induces, in the former, hemorrhoids and prolapsus, and may even cause a hernia through the abdominal walls. Palpation or percussion of the hypogastrium will often reveal, in a person not too fat, an oval tumor rising above the symphysis, and a little sensitive on pressure. Should you, at this stage of the examination, incautiously intimate to your patient that his bladder was filled with urine, you would pretty certainly be met with the reply that it could not be so, as he was sure that he was passing more than the usual daily amount of urine. It is a hard thing for the lay mind to take in the fact that this condition indicates that more urine should come away. He will be more anxious to know how to diminish the quantity passed; his annoyance, he will say, has hitherto been in urinating too much.

Whenever you find these involuntary discharges occurring, always remember the golden rule rightly set forth by Thompson in capital letters, that *an involuntary flow of urine indicates retention, not incontinence*. By the distension the bladder finally overflows, like any other overfilled reservoir. Incontinence is a most rare condition; possible, it is true, in prostatic hypertrophy, but much more suggestive of a central nerve lesion, such as, for instance, locomotor ataxia. If you will but fasten this rule in your minds, it will prevent many errors of judgment on your part.

I have generally, at this point, supplemented the examination thus far made, by an exploration of the rectum, not only that valuable information is to be obtained therefrom, but also because I have noticed, as an instance of the peculiarity of the human mind, that these sometimes unmanageable elderly patients yield their confidence after such a procedure. By introducing the finger, the patient being in a recumbent position, with a gentle spiral motion, having previously not only anointed the finger with oil, cerate, or vaseline, but also the anus itself, and having guarded the nail by stuffing under it with soap, you can readily explore the prostate, and easily distinguish any marked deviations from its normal size. By mov-

ing the bulb of the finger laterally, you can appreciate any irregularities in the surface of the gland ; by pressure elicit abnormal tenderness if it exists, and recognize any extra hardness and the increased deepening of the median groove so often met with. Normally we can reach with the finger the upper border of the prostate and detect portions of the vesiculæ seminales. When you cannot do this, it is fair to infer the existence of hypertrophy. Yet hypertrophy may be present without revealing itself per rectum, especially when it is confined to the median portion. Hence the test of the introduction of the catheter immediately after urination is of prime importance, and the astonishment exhibited by the patient on witnessing the discharge of urine, varying from half an ounce to a pint in amount, from a bladder that he believed was empty, will often be a source of amusement to you. In this manœuvre the patient may either stand or lie down. I prefer to introduce the instrument in the latter position, as it enables me to judge of the amount of atony that may be present. If none or but little exists; when the eye of the catheter passes into the bladder, the urine will escape with considerable force, for the mechanical obstacle has been overcome by your hollow instrument. If atony exists to any degree the flow will necessarily be feeble, but if the patient were erect, the superincumbent weight of the intestines, etc., might expel the urine with force sufficient to mislead one on this point.

Now, this residual urine, as it is technically called, it is true, is met with in paralysis of the bladder, in atony resulting from other causes, as fevers, etc., and sometimes in connection with a tight stricture of long duration, particularly if retention has at any time occurred ; but the first disease, properly speaking, is extremely rare, and in the other forms of atony the history of the case will clearly point to the real cause ; while in the case of stricture, a disease of earlier life, the usual method of systematic exploration, or the catheter should you mistake it for hypertrophy of the prostate, would speedily inform you of the true nature of the

obstacle. But met with under the circumstances detailed just now, residual urine may be considered pathognomonic of prostatic obstruction.

The diagnosis having been made, in actual practice, the treatment follows; but in a lecture, I am compelled to stop a moment longer, to take up what might heretofore have been thought to have been accidentally omitted. I mean, a reference to the causes of this hypertrophy. In reality they are not known. It would only be a waste of time to present to you the various speculations concerning the subject. Some have been based on the analogy anatomically and pathologically existing between the prostate and the uterus; others, on foundations more frail, have ascribed it to a number of different conditions. But we do know, thanks to the able investigations of Thompson and Iversen, much more about the histological changes that make up hypertrophy of this gland. The prostate, it will be recollected, is constituted of glandular and muscular structures, with a connective tissue or stroma. The increase in size is most commonly due to a hyperplasia of the glandular and muscular tissues (the fibrous being more rarely affected), and which is found either diffused or in roundish globular masses, mosaically arranged and of different sizes, and capable of being easily shelled out by the finger nail. This hypertrophy may be said to be due, in the nomenclature of onkologists of the present day, to a myomatous or myoadenomatous hyperplasia (Iversen). According to Rindfleisch there is histologically a "fibro-muscular overgrowth of the peritubular stroma of single segments of the gland, with a coincident elongation and multiplication of the tubuli themselves."

Without any further dwelling on this part of our subject, let us proceed at once to the treatment of the hypertrophied prostate. It is your duty, when your examination is completed, to explain to your patient as clearly as you can the nature of the difficulty that he labors under, in order that he may be fully and thoroughly

impressed with the fact that *he must use a catheter for the balance of his life*. No matter if he has only a tablespoonful of clear residual urine, if the diagnosis is positive, the treatment is so also. Act upon this advice : teach him to use a catheter, even though he may say, and justly too at first, that the remedy is worse than the disease. It is the right principle.

By all your endeavors, and they frequently will be needed, induce such a patient to judiciously persevere in the use of his instrument.

What kind of a catheter is to be recommended, and how is it to be used ?

I shall answer these questions by showing you some catheters, and shall speak of them in the order of preference.

When we reflect on the sensitiveness of the urethra and bladder, so frequently shown by the onset of what is termed the nervous form of urethral fever, after any instrumental exploration, we must appreciate the necessity, not only of great gentleness in manipulation, but also the necessity as well as advantage there is in the use of an instrument as soft and flexible as the red vulcanized rubber catheter that I now show you. It is called, after the distinguished French surgeon, Nélaton's catheter. It is made in England, and bears the mark "Jacques, patentee," on it. This is the smoothest and most durable of the rubber catheters. It only requires as an improvement that the edges of the eye (I wish it had two) should be smoothed off by a heated probe. Here are some of French and American manufacture ; they are not only rougher, but, of these of the same age, two years, you see that all save Jacques's are stiff and unyielding, and readily break when bent : some of them, not so old, bend better, but crack ominously. Hence, avoid them ; choose and use, or try to use, this English catheter in your first explorations. I said, try to use it, for its very flexibility occasionally gives rise to a little difficulty, principally at the bulbo-membranous junction, and sometimes also at the neck of the bladder.

It is to be coated with oil or vaseline, and introduced by a series of short pushes ; and when an obstacle is encountered, a spiral twist is to be given to the push. In the great majority of cases you may feel sure of success with this instrument. Nevertheless, in intrusting it to your patient a single injunction must be given concerning it. It is this, to replace it as soon as it begins to swell or become sticky. Under the action of the altered urine the catheter will after a while increase in size and soften, until, as in these samples, they become, in spots, converted into a tenacious gummy paste—of course, before they reach this condition, unfit for use. But this bit or portion of such a Nélaton's catheter tells another story. I had occasion to extract it from the bladder of a patient who had been using one for several months, notwithstanding he had recently noticed it swelling, and that when it was withdrawn it gave rise to, as he stated, a "sucking, lingering sensation." Twenty-four hours before he called upon me he found that he had pulled out only half the catheter. His alarm was naturally great, and was heightened by the fear lest the portion remaining within him might induce retention. But, happily for him, he found the catheter was in that respect serving him a good turn, for the urine leaked continuously from the meatus. As soon as he could, he came to the city, and I found fortunately that the catheter had not passed into the bladder, as it often does, but that its broken end could be detected just anterior to the membranous portion. With a forceps it was promptly seized and readily extracted. The "sucking" sensation was evidently caused, and your inspection will verify the explanation, by the eversion of the edges of the eye and the disproportionate enlargement of the terminal end of the catheter. So now I advise a patient to keep two of these, or in fact of any kind of catheter, always on hand, so that no inducement to use a faulty instrument may be afforded him.

Should the rubber catheter, from any reason, not be of the desired service, we have an excellent substitute in Mercier's flexible

catheter, "coudée" or "bicoudée," that is, having a short elbow, single or double, near the end. Such a bend naturally causes the end to run along the upper and unaffected wall of the prostate; and should it meet with any obstruction, a slight twist of the shaft will cause the angular end to glide to one side or the other, as may be wished. To indicate the situation of the point, it is best to have a mark of white paint on its distal end.

Next in desirability is the French conical, olive-pointed, flexible catheter, with a fixed curve, which is made so by having the upper side made a little shorter than the lower one.

The fourth in order of usefulness in my hands is the blunt English catheter of Weiss' make, brown in color, and showing the texture through its transparent covering. This should be kept mounted, as suggested by Thompson, on an over-curved stylet, but curved, remember, to the very end. It preserves this curvature well while passing through the warm urethra, and likewise, by hugging the superior wall, often overrides an obstacle otherwise insurmountable.

Sometimes, when this fails, an ordinary elastic catheter, introduced with its stylet in situ as far as it will go in the urethra, will, by then withdrawing the stylet an inch or two, have an extra curve or lift upward imparted to the end, and its onward progress thus be secured.

It is only when these milder measures do not succeed that recourse is to be had to metallic instruments. These require more anatomical knowledge in their employment, and from their very rigidity can do more harm if incautiously used. Two widely different curves are of avail—one less than the regulation curve of three and a quarter inches radius, and the other much greater than this. The prostatic urethra, as I have previously told you, is sometimes in these cases increased in length to nearly three inches, and also thrown forward as well as to one or the other side. This latter direction is distinctly shown in certain cases by the deflection given

to the rings of the catheter or to the handle of the sound when this is resorted to for the detection of a stone, or when an exact diagnosis of the size and shape of the internal enlargement is attempted. The standard length of fourteen inches given to the silver catheter, denominated prostatic, is, however, unnecessarily great. Individually, I have found the shorter curve to answer the desired purpose better than the other.

There is another metallic catheter recommended also by Mercier, to obtain an entrance to the bladder in those cases where a false passage, made either by the patient or surgeon, exists. The eye of the catheter, you will notice, is in the concavity of the instrument, and through this, when the end is engaged in the false passages, is pushed a small flexible catheter or bougie, which, emerging at a slightly different angle, will thus, in all probability, escape the by-ways and pass on to the bladder.

I have had, however, no experience with it. In those cases where retention exists with this complication, it is preferable to let the injured urethra alone, and to relieve the distended bladder by the aspirator : and where this urgency is not present, it is, of course, better to wait a few days for the injured parts to heal.

I shall occupy your attention only a moment longer to show you a metallic catheter which is not rigid. It is the vertebrated catheter invented by Dr. Squire, of Elmira, N. Y., and consists of a number of hollow links or sections held together or strung on a wire, which, by a screw at the outer end, is tightened or loosened. It is introduced, say, rigid, with any desired curve, and, if necessary, a turn of the screw so relaxes the links that the greatest flexibility can be given to it. It works well, but I confess I am always afraid to use it myself, or to let my patient use it, lest the wire should give way in some part. It is too complex, and simplicity is always desirable.

This last instrument is one that you possibly are familiar with in its application to the treatment of urethral strictures. It is the

fine conducting bougie of Maisonneuve, which, in difficult prostatic obstruction with retention, I have resorted to with success when other expedients have disappointed me. It is, of necessity, extremely flexible, and when it has been successfully introduced, a slender catheter is screwed on and pushed onward, the guide curling up, as you know, in the bladder. Over this, after learning that the vesical cavity is reached by the drops of urine that escape, a large, flexible French catheter, open at both ends, is passed.

You should, however, be aware, gentlemen, that no invariable rule can be given as to which instrument is the best for a patient to use, for although, as previously stated, the rubber one is to be preferred, yet the peculiarities of each case must be taken into consideration. Also, the feebleness of the hand and eye of the aged should not be lost sight of in the choice.

Patients, moreover, are apt to use more force than a surgeon would, and, notwithstanding they possess the indubitable advantage of feeling with both ends of the instrument, yet mishaps often occur. Such are exemplified in these broken, bent, and dented silver catheters, most of which, I must confess, to explain their condition, were taken from men intemperate in habits as well as old. An additional expedient to those in common use has been lately put on record by Dr. Young, who, in a patient who had broken off in him a No. 8 (English) silver catheter, extracted the piece successfully by removing the eyes from a No. 11 catheter and passing the open end of this instrument down to and over the broken end in the urethra. By making an angle with the larger catheter, it locked the smaller one, and enabled the surgeon to make the necessary traction for its removal. Bear this expedient in mind, for, failing in this and other methods, you would have to perform median or lateral lithotomy, an operation which, you are aware, is of very considerable risk.

The reply to the question how the patient is to use the instrument selected, can be given very briefly.

It is to be used the first few times in your presence, and experience here has confirmed the truth of the motto, to hasten slowly. After the first introduction of the catheter (of the size No. 8 or 10 of the English scale) by either himself or yourself, direct him to keep quiet the balance of the day, to drink freely of either plain or the non-aperient mineral waters; and at the same time warn him that he may expect a little irritation of the bladder for twenty-four hours or so. Sometimes the irritation is very decided and of longer duration. Several days or a week is allowed to pass before the lesson is gone through with again. After this, the intervals can be decreased until, depending upon the amount of residual urine, the catheter is passed without irritation once, twice, or thrice daily. In some forms of obstruction of long duration, urination can only be accomplished by the catheter, and hence, unless the atony present is sufficiently great to allow of distension without pain, the use of the instrument will be even more frequently required than this. With the metallic catheter, a more systematic instruction will be demanded; but in other respects the same directions are to be followed.

If I have not already given you the injunction, remember that where much residual urine exists it is best not to completely empty the bladder in one sitting. Take a week or more to do this. Past experience has convinced surgeons of the necessity of this care, and none have pointed it out more clearly than Brodie that a cystitis of varying severity is apt to be lighted up by a departure from this rule. Now whether this is due to the wrinkling, so to speak, of the bladder when relieved from long-continued distension, or to the changes in the circulation that ensue under such conditions, or whether it results from the slight violence of an instrument however carefully managed, or whether, as has been lately mooted, the inflammation with the production of ammoniacal changes in the urine is due to the introduction of bacteria by the catheter, I cannot positively say.

The latter view has been enunciated by the eminent Pasteur, who even ascribes the transformation of urea into carbonate of ammonia to a special ferment belonging to a torula described by Van Tieghem, which is, it is stated, introduced into the organ by the catheter. But it happens that the urine is ammoniacal in those who never have had an instrument used on them, a fact that is quite conclusive, unless the germs can pass into the meatus urinaris and proceed along the deeper parts of a closed canal, as Pasteur says, in explanation of these spontaneous cases, they do. He has, however, shown elsewhere, that unclosed tortuous glass tubes with mouths opening downward are sufficient to bar the entrance of germs into a fluid. The question of the germ theory, as applied to disease, is, I take it, not yet far enough advanced to admit of a prompt solution. We must, therefore, suspend our judgment on this point. If its slight consideration now should impress you with the clinical importance of extra measures of cleanliness and disinfection in the care of your catheters (acknowledged to be a difficult task), it will be of real service to your patients. We can, however, hold on to the fact for its practical value, that a urine in long contact with an inflamed mucous membrane will become alkaline by the disintegration of the urea, etc., and that such changes are rapidly abated by the use of a catheter.

The *cystitis*, however generated, whether of vesical or prostatic origin, demands a few special remarks. Whenever it presents itself in its acuter form, with frequent burning micturition, torturing vesical tenesmus, and with cloudy, muddy, or bloody urine, and other lesser symptoms, treatment of the following kind must be employed. Put your patient in bed with his hips elevated, to secure rest and an equable temperature of surface, and administer an anodyne, preferably as a suppository, containing one to two grains of the watery extract of opium, with half a grain of belladonna. This can be repeated every four or six hours. Give also alkalis, such as citrate of potassa in half-drachm doses, in lemon syrup,

four or five times a day, or the old combination of the carbonate of potassa and tincture of hyoscyamus in mucilage, in order to take away the acidity of the urine, which acts as an irritant to the inflamed mucous coat. Drs. Van Buren and Keyes, with "apt alliteration's artful aid," speak of attitude, alkali, and anodyne as the tripod of treatment. A hot hip-bath, of short duration, to congest the surface and not the whole pelvis, is very soothing, as also are hot fomentations to the hypogastrium. The bowels, if necessary, can be best moved by large injections of quite warm water. The use of the instrument must be stopped until the attack has fully passed over and has either resumed or taken on the chronic form. Before allowing the patient to begin again its use, carefully inspect his instruments, so that you may be sure that his recent cystitis, epididymitis, or prostatic abscess—they all may so occur—was not due to a faulty catheter; these that I have in my hand are some once flexible catheters, of both French and English manufacture, that have from use become roughened, cracked, and blistered in spots, and their eyes fissured, ragged, and sharp. Do not think I harp too much on such points; their utility you will acknowledge as years pass on.

While, in the generality of cases, the systematic emptying of the bladder will be followed by the diminution of the frequency of micturition and restoration of the urine to a normal clearness and acidity, yet, where there has been much production of muco-purulent material, or where the symptoms of cystitis have existed for a length of time, additional measures can be afforded the patient, by the use of which he can, independently of the surgeon, supplement the use of the catheter.

You must, therefore, teach him how to wash out his bladder. You wish to remove the muco-pus that may still be adherent to the bladder emptied by the catheter. Possibly you may know that your patient has a sacculus, by witnessing, what is somewhat rare, that urine of a different color from that first drawn is passing, and

that it is, perhaps, more purulent than the other, from having been detained longer in the inflamed pouch of mucous membrane. Should this be met with it would be an additional reason for thoroughness in washing out the vesical cavity. This could not be accomplished were you to employ the ordinary double catheter, for the water injected merely flows from one eye of the instrument to the other. Hence it is much better to use a single rubber catheter, the same that you have drawn off the urine with, and to throw into the bladder from two to three ounces of warm water, or less if the patient complains of any feeling of fullness or distension, when it is immediately allowed to flow off. This is to be repeated two or three times, and the procedure is completed. The water can either be injected by a common Davidson's syringe attached to the catheter, or better still, as it avoids the slight shocks caused by such syringes, and also because it does not require the retention of the catheter so long in the bladder, by means of the fountain syringe. This is, as you see, a rubber reservoir with a tube leading from its bottom to a two-way stopcock, one end of which is to be inserted into the catheter, and the other, which is the outlet, held over a basin or other receptacle. The reservoir containing warm water is held or suspended above the level of the patient's pelvis, and when his sensations indicate a slight distension, the little stopcock is turned, the current is instantly reversed, and the water flows out into the utensil provided to receive it. This is repeated, as with the other syringe, two or three times. Should, for any reason, the urethra resent by its irritability the use of a catheter, injection of the bladder can often be performed by simply inserting the nozzle of the same fountain syringe into the urethral orifice, when the hydraulic pressure, increased if necessary by a greater elevation, will, in a few moments, overcome the resistance of the compressor urethræ muscle, and allow the fluid to enter the bladder.

This washing out can be resorted to once a day, and sometimes oftener, and is of inestimable benefit to this class of patients. Per-

sistently carried out, day after day, it rarely fails, with its coincident withdrawal of residual urine, to ameliorate and even to restore the chronically inflamed bladder to a condition certainly of comfort, and, if used early in the affection, to one of approximate health. It may happen in your explorations and lessons given to the patient, that you are able to recognize, by the free escape of muco-pus before the catheter enters the bladder, and by the similar effect produced by pressure on the prostate per rectum, that either there is a dilatation of the prostatic urethra, or, what is more probable, that there is a cavity in the gland, resulting from some former abscess. When this is detected you may sometimes successfully wash it out, and relieve the perineal pains accompanying it, by using the double catheter which I have just condemned for bladder service.

More than this training in the use of the catheter and syringe you will not be called upon to do in the greater number of the cases that you may assume the direction of. It is seldom that it is advisable to resort to medicated injections, and the list of them becomes fewer and they are more seldom required as experience gathers. In those cases that do not yield to the simple blood-warm water, the employment of these four medicated injections will probably be of material service in the treatment, viz.:

1. Nitric acid, sufficient to slightly acidulate the water used, especially good if much mortar-like phosphatic gravel is formed, as the nitrates are generally soluble.
2. The acetate of lead, for the same purpose, and of the strength of one-sixth to one-third of a grain to the ounce of water.
3. Borax, fifteen to twenty grains to the ounce, with the addition of a small amount of glycerine.
4. Carbolic acid, one or two drops to the ounce of water. Unfortunately we cannot with this disinfectant, test in the bladder, as you might suppose, the germ theory, since, according to recent investigations, it requires a two per cent. solution to arrest the motion of bacteria. This strength is much too great to be used in

the bladder. I have been lately experimenting with boracic acid, to this end, but have not as yet arrived at any definite conclusion.

These injections are to be made after the second washing out of the bladder, and may be entrusted to the patient after the surgeon has satisfied himself that they act satisfactorily. As to the internal treatment, it can be dismissed with a very short mention. A somewhat extended trial of the various infusions and decoctions recommended by the authorities has led, I am sorry to say, as it is, perhaps, not orthodox, only to most unsatisfactory and generally disappointing results. The same amount of flaxseed tea, or its equivalent water, produces, I think, in most instances, equal effects. The remedies most in favor in the profession are, however, *tritium repens*, *alchemilla arvensis*, *buchu*, *uva ursi*, and *pareira brava*. For their administration I must refer you to the works of Thompson and Gross.

By the observance of the directions that have been given, you may hope to bring a patient afflicted with an hypertrophied prostate to a condition of ease and freedom of risk, preventing, if not already formed, both calculus and renal disease, and thereby most materially and most positively lengthening his days. It is true his bladder will always be his weak point. Colds and exposures to fatigue, etc., will be felt in their slight effects here. His perseverance and carefulness is the price he must pay for urinary comfort in his declining years. Other cautions must be given. Certain hygienic laws must be followed as to exercise, etc. He must be warmly clothed, his bowels carefully regulated, as *scybalæ* forming in the colon or rectum harass the bladder, and, in a neglected case, may lead to a fatal issue. I omitted, when showing you the various specimens illustrating the disease, to ask you to observe one where the rectum had been preserved, as it showed numerous marks of ulceration scattered over its anterior surface. This had occurred from an obstinate constipation, which, inducing inflammation of the rectum, fairly wore out the waning strength of the worthy philanthropist

from whom it was removed, by the incessant tenesmus which spread from the rectum to the bladder.

Concerning the formation of a calculus during the progress of a chronic cystitis of prostatic origin, you must ever keep in mind the possibility of its occurrence, and you would therefore be justified, even in the absence of some of the usual signs belonging to this usually painful complication, in resorting, where any suspicion was aroused, to the exploration of the bladder by a sharply curved sound, upon the principles which have been laid down for our guidance, but which time will not allow me to dwell upon at present. And for similar reasons, the surgical treatment of a stone, once detected, must also be postponed to a future occasion.

In the few minutes yet remaining to the close of the hour, I shall have time, I trust, to allude to the *hemorrhage* and *retention* of urine, that often coexist, and as often result one from the other. It has previously been pointed out to you, that whatever causes prostatic congestion augments the size of the already hypertrophied gland, intensifies the obstruction, and increases the muscular irritability of the bladder. As a result, when this congestion occurs, the customary introduction of the catheter will often develop a hemorrhage, which, if moderate, may possibly be salutary. It may also, and does so most commonly, come on spontaneously, and, from whatever origin, is a source of alarm and danger, not so much from the amount, but from the possible plugging up of the vesical orifice with a coagulum. Retention of urine is thus brought about in a manner not yet alluded to. The amount of hemorrhage in such cases, contrary to what is often stated, is rarely great. You will find, should you have to use the aspirator, that the greater part of the distension is due to the urine, and that the clots occupy but a small portion of the bladder. To arrest the hemorrhage, bear in mind the suggestion of Cazenave of Bordeaux, to insert into the rectum small pieces of ice with the

edges properly smoothed off. Fortunately we are not often called upon to interfere with the blood that has accumulated in the bladder. If the retention is not absolute, and the patient's distress not great, you can afford to wait a little while, knowing that the urine will speedily dissolve or disintegrate the clots. Should, however, urgency exist, you are to pass in a silver catheter, not rubber, because you may wish to perforate or break up a coagulum, and thus relieve your patient if you can. Unluckily the eyes of the instrument will often become clogged with masses or plugs of coagulated blood, and thus be disabled and of no avail. When this happens you should not defer using the aspirator. By this instrument, with the No. 2 hollow needle, I found some time ago that I could not only relieve my patient of his urine, but also through it was sucked clots surprisingly large in size. To convince and surprise you likewise, I have filled this pig's bladder with blood and urine, and will now thrust into it the same aspirator needle. Through this tube, of a diameter of one millimetre, you can perceive quite large clots passing with ease and rapidity.

When after two or three aspirations it is ascertained that the hemorrhage is persisting, by the color of the urine as well as by the continuance of frequent clots, it can often be speedily checked, after emptying the bladder, by throwing cold water into it, by reversing the rubber tubing of the aspirator. This procedure has been successful in a sufficient number of cases to warrant my bringing it to your notice.

The *retention* of urine that comes on either from this last-mentioned or other causes, is of a much more serious nature, and is fraught with much more danger to your patient than the retention, for instance, that complicates stricture. Not that rupture of the bladder is to be apprehended ; it is so seldom met with that it can be thrown out of consideration. Distension, however, can go on to a remarkable extent, and Brodie's celebrated case, where eleven and a half pints of urine were drawn off by the catheter, is more

than matched by the one narrated by Dr. Pinkham, in the *Medical Record* of last year, where seven quarts were similarly removed. The actual risks from the acute, as distinguished from the gradual or chronic retention, are twofold : first, the atony that may be caused, and second, the inflammation that follows. If not promptly relieved, the bladder, which has for a long time previously been more or less distended by residual urine, and thereby suffered a partial atony of its muscular fibres, is now most likely to become totally atonied, and for a long time after, and possibly forever, be nothing more than an inert flabby reservoir, difficult to wash out, prone to inflame, and possessing only one good qualification, and that is, of not feeling pain when filled up, so that instead of the bladder telling its possessor when to relieve its wants, the patient can now select his own time to empty the organ.

The inflammation which so often succeeds an attack of retention, whether acting simply as a cystitis or by generating one of the forms of urethral fever, is very apt to have a fatal termination. In a great number of cases, notwithstanding the relief afforded by your successful catheterization, soon after, possibly the next day or the next time you have to use the instrument, the urine that may have been clear, or nearly so, has changed its character, and now emits an ammoniacal odor ; a chill occurs, one or several, with more or less fever, sweating, dryness of the tongue, slight delirium and dullness of intellect, then stupor, coma, and death. If life is prolonged several days in this condition, as it may be, emaciation will rapidly show itself, and bed-sores form over the sacrum and elsewhere. The secretion of urine is rarely suppressed, but continues free and of a pale color, and rather less specific gravity. The extension of the inflammation from the bladder to the kidneys, explained some time ago as the surgical kidney, and which is more frequently associated with prostatic disease than with stricture, is also known as one of the forms of urethral fever. Goodhart,

of London, speaks of it as an erysipelas of the urinary tract. It is met with in more than half the deaths that result from obstructive diseases of the urinary organs. Unfortunately, even when we have ample time for the investigation of a chronic trouble of the urinary organs, we have no means of positively recognizing the existence of the pyelonephritis that is often present in a quiescent state as the forerunner of this fatal disease.

Your frequent microscopical examinations of the urine of your patients will probably have taught you, though, to expect, in a certain proportion of cases, the coincidence, or consequence, perhaps, of some one of the forms of Bright's kidney. It renders the prognosis, when it is detected, of course additionally grave, and in retention gives rise to the anticipation of the most severe uremic complications.

When these unfavorable symptoms supervene, we can do but little for their relief: counter-irritation long kept up to the loins, saline cathartics, and the hot-air bath may be tried, but, I regret to say, will nearly always be in vain. Moxon and Wilks have, however, recognized post-mortem conditions which they ascribe to old cured suppurations of the kidney.

The recognition of the distended bladder is a matter commonly easy enough, except in men with fat, pendulous bellies, where palpation and percussion are sometimes uncertain—and by some one of the various instruments that have just been described you may fairly hope to succeed in obtaining an entrance into its cavity. Should you fail in this, you must resort to aspiration, and this is to be repeated until either the bladder somewhat regains its expulsive power or you have succeeded in carrying your catheter successfully past the obstacle. Where such instrumental attempts, even though successful, have been followed by a chill and fever, I have abandoned for a day or two any attempt to enter the prostatic urethra, and have resorted to the aspirator needle two or three times a day. With this method, that is, aspiration, to fall back

on, it is not requisite in a case of difficulty to leave in a catheter, which, as is known, is always resented, however soft and flexible it may be, by the hypertrophied prostate.

I know of but a single case wherein the repeated minute punctures of the aspirator needle have been followed by any serious consequences, and in this it was used a number of days after the proper operation of external perineal urethrotomy was permissible, and eventually gave rise to peritonitis.

Inasmuch as it has been thought by sundry French observers that the symptoms presented after the onset of an attack of cystitis, such as those previously narrated, are due to the absorption of carbonate of ammonia in poisonous quantity, it has been recommended by them to overcome the alkalinity of the urine by benzoic acid, which you remember is one of the few substances that will accomplish this end. Mineral acids will not do it, though lemon juice in large quantities and gallic acid will. MM. Gosselin and Robert, the advocates of this plan, use from fifteen to forty-five grains of benzoic acid per diem. In a few days the alkalinity of the urine disappears, and the feter and smell of ammonia vanish. In the few instances in which I have used this drug preparatory to the performance of lithotrity or lithotomy, considerable gastric disturbance, such as nausea and vomiting, was created. In certain cases, where time is ample, it is worthy of a more extended and varied trial.

Before closing my somewhat hurried remarks on hypertrophy of the prostate, I wish to say further, in reference to that form of prostatic difficulty which is associated with but little residual urine but with great irritability, that once excluding the possibility of the vesical irritation being due to a disease of the kidney itself, perseverance with the catheter is to be encouraged. Comfort may, perhaps, be obtained by injections of hot water into the bladder, as hot as can be well borne, and with as much pressure, gradually increased, as can be tolerated. One-fortieth to one-

twentieth of a grain of atropine thrown into and left in the bladder will occasionally calm the irritated muscles. But the confession must be made that failure is more frequent than success in this variety of prostatic troubles. This condition, however, is one in which we may hope for improvement rather than damage should at any time retention occur. The distension resulting from this, by the atony produced, often effectually relieves the patient of his tormenting vesical irritability.

Where failure has occurred in overcoming the intolerable cystitis by the various expedients that I have brought to your attention, and especially if inherent difficulties to the easy or daily introduction of an instrument are present, naught remains but the procedure put into use some ten years since by Van Buren, and more recently by Thompson, of making a permanent suprapubic opening into the bladder, and thus allow the prostatic urethra to fall into disuse, in the same way as colotomy does in the case of an ulcerated rectum.

Finally, gentlemen, all that has been enjoined upon you in the way of treatment, would be sadly in fault did I not reiterate what has been for this intent left to the last word—that in all your manipulations of the urinary organs, let the greatest rule be to you embraced in the one word—gentleness—never force.

POINTS IN SURGERY,

BY

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I. CONGENITAL PHIMOSIS.

GENTLEMEN :—The little patient before us, Willie K., aged three years, is brought here by his mother on account of some urinary difficulty. The principal feature of his trouble of which she complains is somewhat peculiar. It is that instead of ejecting the stream of urine straight before him, he discharges it sidewise, in such a way as constantly to wet his left shoe, which, as you see, bears evidence of having been pretty thoroughly and frequently soaked. In addition to this, he does not hold his water well, frequently wets his clothes during the day, and his bed by night. For these infirmities, sufficiently annoying to a careful and cleanly mother, though, to say the truth, the child does not care anything about them, she seeks relief at our hands. Upon examining the patient, we find that he presents a well-marked example of the condition known as congenital phimosis, by which term we understand an unnatural narrowness of the preputial orifice, so that the glans penis cannot be uncovered. Quite frequently, as is the case here, not even the meatus urinarius can be brought into view. In this child's case, also, the prepuce is preternaturally long, attached by adhesions, I suspect, to the glans, and, as you observe, its end is a little swollen and puffy, and bright red.

The term phimosis is derived from a Greek word signifying a muzzle: the condition to which it is applied is such as I have

described in a few words, and such as you see in the case before you. So far all is simple enough ; but not so simple, nor so easily described are all the inconveniences that follow upon this condition ; evils not always in proportion to the apparent insignificance of their cause, but sometimes of a most serious nature ; evils, too, which many of us, myself included, were left to find out for ourselves by many vexatious experiences, and which, I fear, to this very day, many physicians scarcely appreciate at all.

You will, therefore, excuse me if I occupy a considerable portion of your time this morning in descanting upon what may appear to some of you a very trivial matter, but which I can assure you is not so, as you will find out in due time, but which it is better that you should understand now rather than discover in future by mortifying mistakes and omissions.

The bad consequences that result from the continuance of this condition of phimosis are very numerous, and very various, some of them referrible to the urino-genital apparatus particularly, others to the system at large. The special complaint that this woman makes of her child, that he urinates side-fashion, is new to me. I do not remember ever to have heard of it before, and it is a circumstance the full annoyance of which would only be experienced as the child grew up, should it continue so long. But the other symptoms he mentions, of diurnal, and more particularly of nocturnal incontinence of urine, are very common results, and very distressing ones sometimes, of phimosis.

Nocturnal enuresis, as it is called, is a very common complaint among children, and my experience accords with that of most of the writers on the subject, that it is much more common among boys than girls.

It is not only a very common, but generally a very intractable disease, when treated in the ordinary way by drugs. All sorts of medication and appliances have been recommended for it, and all of them fail much oftener than they succeed. Unless a surgical

view is taken of the disease, and surgical treatment adopted for its cure, I do not wonder that physicians dread to be consulted about it, and fairly give it up as one of the incurables.

But I have come to take what I know many will consider extreme ground on the subject. I regard this affection in boys as almost always the result of phimosis.

Not necessarily of extreme phimosis, such as you see here, but quite often of that moderate degree of it which may almost be considered the normal condition in little children. But we generally find, if we operate upon these patients, there is in addition adhesion, more or less extensive, between the foreskin and the penis.

I do not intend to attempt any explanation of the exact mode in which this condition produces enuresis, for I do not know that I could offer one that would be entirely satisfactory even to myself.

Probably it arises from some reflex irritation started from the genital organ, whose sensibilities are so peculiar, and whose range of sympathies are so extensive and powerful that it takes almost a lifetime to learn them fully.

But, be the explanation what it may, of the fact itself I entertain no doubt whatever ; it has been proved to me in practice over and over again. It is only a few days ago that I was consulted about a fine, healthy boy, a splendid-looking little fellow, who was a constant source of mortification to his parents and distress to himself, by wetting his bed by night and his clothing by day.

He had been treated medicinally to no purpose ; moral suasion and Solomon's more potent prescription of the rod had also been tried in vain. His health was perfect ; nothing could be found the matter with him but a slight degree of phimosis. I advised that this should be operated on in the way I will presently describe and demonstrate to you. When it was done, very considerable adhesions were found between the inner layer of the prepuce and

the surface of the glans penis. The operation produced a complete, though not immediate cure.

I do not wish to deceive either myself or others, or lead you to form anticipations that are not likely to be realized, but I must declare my belief that this simple operation, when at all indicated in these cases, always cures ; at any rate, I can truthfully affirm that I have never known it to fail, and I have done it a great many times.

There is another source of irritation frequently present in addition to the stricture of the prepuce and the bands of adhesion, which I have not yet mentioned.

I allude to the collection of smegma, that peculiar cheesy, sebaceous secretion of these parts, behind the muzzled prepuce. This accumulates sometimes in large quantities, forming a complete ring filling up the sulcus behind the corona glandis, and becomes, by its prolonged retention, very fetid, and I should judge, from the acrid, penetrating odor with which it has sometimes assailed my nostrils, very irritating, as I make no doubt it is. Besides this secretion, we sometimes have urine collected in this sac of the prepuce, the orifice being so narrowed as not to permit the ejection of the last portions which are not driven forward by the strong expulsive efforts of the bladder. Now, urine, you all know, is a fluid which very quickly decomposes under favorable conditions, and when decomposed is extremely irritating to the animal tissues. What more favorable conditions could be presented for its decomposition than pocketed up in the prepuce at a temperature of ninety or one hundred degrees? Of its irritating properties, when thus retained, I have seen numerous evidences.

I have seen the penis intensely swollen and painful under such circumstances, the patient thrown into a high fever, and evacuation of the bladder rendered impossible, except by artificial assistance. There is another consequence I have once seen from this state of things.

It was in a boy, who had a pretty tight phimosis, rendered still narrower from slight inflammation of the end of the prepuce, in whom stillicidium from the overcharged bladder had come on, and gradually filled and distended the preputial sac till it hung from the end of his penis in a semi-transparent bag as large as a pigeon's egg, presenting a most astonishing sight, and giving rise to severe pain.

Something like this, but not to the same extent, may be caused by inflammatory exudation of a serous character taking place between the two layers of the prepuce, separating and distending them. Constant and slight accumulations of urine within the prepuce have been known, by deposit of their sediment, to produce calculus in this situation, and very considerable concretions have been removed. An inflamed condition of the head of the penis from any of the irritating causes mentioned is not uncommon, and indeed is very frequently met with in cases of phimosis. This is evidenced by the red, swollen, pouting lips of the preputial orifice. There is a constant itching and sense of uneasiness, which leads the child to frequent fingering and manipulation of the part : very likely he screams aloud whenever he makes water and the urine passes over the inflamed or abraded surface. Such children sleep very badly ; they are apt to awake with a start and cry, often with the penis in a state of painful erection ; and this may go on for a long time, being attributed to indigestion, nightmare, worms, and so on, until the real cause is discovered. Sometimes we have a regular balanitis set up in this way, with eventually a rather free discharge of pus from the penis, which has been mistaken for clap, and the little fellow supposed to have been contaminated by some incredibly wicked person. The irritation thus originating is not infrequently propagated along the urethra to the bladder, and may in time give rise to a genuine cystitis, presenting all the symptoms of stone in the bladder, and not to be distinguished from that affection except by sounding, which being

attempted, cannot be carried out on account of the phimosis which exists ; and this being relieved, no stone is found, but the case is cured. It has happened to me rather often to have children sent to me for stone in the bladder, when nothing but phimosis existed, which being remedied, the symptoms of stone disappeared. A similar experience is common to all practitioners of surgery, and is referred to in most of the modern text-books. Inasmuch, however, as the symptoms of stone and of phimosis have so much in common, it is a useful precaution, which I always take, and recommend to you, to combine careful sounding of the bladder with the operation for phimosis. It is no extra trouble, the child being already anæsthetized, as he should always be for either procedure, and may save much mortification and chagrin.

Children with phimosis, especially if it be at all extreme, are very subject to erections of the penis, and I have seen some in whom the organ was in a state of excitement a greater part of the time, and others in whom it would not tolerate the slightest touch or irritation without becoming so. This is a very unnatural condition, and sure to lead to harm. Such children are apt to be feeble, anæmic, puny, and excessively nervous and irritable. And though not much is generally said about it, they not infrequently become confirmed masturbators in even babyhood. The irritation of the penis provokes handling, rubbing, and stretching of the organ ; this alleviates the tormenting itching and erethism, and gives rise in its place to agreeable sensations, which in older people we call erotic. For both these reasons the manipulations are frequently repeated, until sometimes the child will spend most of his time when not watched in this manner.

As already intimated, the effect of this condition upon the health of these patients is often very disastrous ; they waste away, become puny, fretful, nervous, and the victims of a host of anomalous and often very perplexing symptoms. Neuroses of various

kinds, in the shape of neuralgias, various forms of paralysis, and attacks that in other patients are called hysteria, are induced.

Dr. Jacobi, of New York, has recently called attention to this class of cases in a very interesting article in the *American Journal of Obstetrics*. He there mentions, with surprise, that certain of these neuroses, which in older persons are more commonly found in females, in childhood occur most frequently in boys. Perhaps the cause is to be found in this very condition of phimosis, and its accompanying irritations.

An accident of a painful nature, which is sometimes occasioned by partial phimosis, is the opposite condition of paraphimosis. The child is led by the irritation set up by his condition to pay undue attention to his penis, experiments with it in a variety of ways, and finally succeeds in retracting the foreskin, but cannot return it, and afraid to mention the matter, and unaware of its importance, it is not discovered until pain and swelling come on. Even where there has been no masturbation, chorea and convulsions may be caused by phimosis; and Dr. L. A. Sayre has recorded cases where well-marked paraplegia has resulted from this cause alone, and has been cured when the phimosis was relieved, though it had previously resisted the most careful and apparently well-directed treatment. It is said that in these cases, especially where the phimosis is extreme, the size of the glans penis is much reduced by its close imprisonment. This I have myself noticed; but I have also seen the glans, and indeed the whole organ, considerably enlarged: this latter is more apt to be the case where there has been much handling of the parts by the patient. Enough has been said to show that phimosis is not, after all, a trifling matter to be dismissed with a mere definition, but a condition of serious importance, and one to be taken into consideration and examined for in a large number of cases.

Now, when found, what is the proper treatment for its relief? My answer is circumcision.

This is generally considered unnecessary except in extreme cases. But I think such a decision is injudicious ; and wherever the condition exists, if it produces any trouble whatever, or any condition exists which is even probably traceable to it, I would operate. It is said that if left alone, in many cases it will cure itself in time ; that as the organ grows, the prepuce will enlarge, and it will emancipate itself from its prison. This is true ; but much avoidable trouble may in the mean time take place. And then the operation, so far from having any objectionable consequences, has a good effect in many ways. It facilitates cleanliness, and is, I have no doubt, a preventive of venereal infection. It has been said that it can seldom be necessary, and should be resorted to charily and with reluctance, for if nature had intended the head of the penis to be uncovered, she would not have constructed a prepuce for it. To this I have nothing to say, except that we find it constantly necessary to improve upon nature, and that it is no more true in the physical than in the moral world that what is natural is always best. Whole nations, as you well know, have adopted circumcision of male children as a universal practice, and with apparent advantage. Please don't understand me, however, as advocating this universal performance of the operation. But let me say that, notwithstanding, I think very strongly it ought very frequently to be done where it is not, and I cannot see any harm likely to ensue even if it be occasionally performed unnecessarily. Some surgeons advise distention or rupture of the constricted foreskin, and have devised very ingenious instruments for this purpose.

I have had no experience with these instruments or methods : it therefore becomes me to speak of them with modesty, but I cannot help saying that they seem to me inefficient, imperfect, and unnecessary.

Although you may enlarge the preputial orifice sufficiently in this way, without any danger of its recontraction, still there

remain in many cases the adhesions I have spoken of, as a still existing source of trouble. And the existence or absence of these adhesions can never be satisfactorily known until the prepuce is completely retracted ; and to stretch the prepuce and then discover and operate for them seems a roundabout way at best. For these reasons I discard the stretching operations.

Others recommend the slitting up of the prepuce along the dorsum on a director, and then trimming or rounding off the edges of the flaps thus formed, and perhaps uniting the skin and mucous layer of the flaps by a point or two of suture. This is, no doubt, an efficient mode of operating, but seems to me an awkward and inelegant one. The result can never be as neat and comely as by the clean and perfect abscission of the prepuce, and, unless carefully done, will be quite unsightly.

The operation of circumcision is the one I prefer, and I have been in the habit of performing it according to the method I will now describe and demonstrate. The prepuce is pulled forward, and enclosed between the blades of these long straight-bladed dressing forceps, which close upon it and are fastened by a slide like a sort of clamp. All that portion which projects in front of the blades is to be removed, and their straight edge forms a convenient guide for the incision, which is made close along their border like a line drawn along a ruler. I use these simple forceps because they answer the purpose perfectly well ; but if any of you should see fit to improve upon them and invent something better, I hope you will do so : for my part I have no fancy for the invention of instruments. I have seen this operation performed by a Jewish rabbi, who used a bifurcated or split spatula, through the fissure of which he pulled the prepuce and then cut it off. This is not so good as the forceps or clamp, which, in addition to fixing the prepuce more steadily, restrains hemorrhage, and thus enables you to make your cut with more precision. With regard to the amount of skin to be removed, some caution needs to be given.

If you are careless in this respect you may easily remove too much, as the integument here is very extensible, and retracts very much after the incision. I have read of a surgeon, who, I suppose, must have belonged to the dashing order of operators, who, taking hold of the end of the prepuce and pulling it pretty forcibly forward, cut off all that projected beyond the glans with one bold cut, and found, to his mortification, that he had completely denuded the penis up to its root—a very embarrassing predicament to be in, I should think. I have seen the recommendation to mark a line with ink just in front of the corona, and, fixing the forceps just on this line, you would be perfectly safe from the danger of removing too much. This is a very good plan, and one that I used to follow when I first began, but now I feel that I can trust myself very well without it.

In performing this step of the operation, you will find the most convenient and expeditious plan to be to take a narrow-bladed, sharp-pointed straight knife, and having spread the portion of the prepuce in front of your clamp or forceps out flat, to transfix it in the middle, and cut first one way and then the other.

Any other way of making this incision is quite troublesome, as the skin is so loose that it wabbles about under the knife, and the cut, besides being less quickly effected, is apt to be jagged and uneven. You now take off your forceps, and find that you have only removed the outer or tegumentary layer of the prepuce : the inner or mucus layer still remains closely attached to the glans. You now pass a grooved director under this, and divide it quite up the corona with scissors, turn it back cuff-like, and attach it to the cut edge of the skin.

The rabbi whom I saw operate, and to whom I have already referred, simply tore up the mucus layer with his thumb nails, and turned it back against the retracted edge of the skin, trusting to the natural adaptation of the parts and a simple bandage to promote union. He had his nails left long, and trimmed to a sharp point

for this very purpose, as he afterward showed me. I prefer to incise the mucus layer and attach it by sutures. For this purpose I use very fine sutures of black silk, and put them quite close together. The black silk is more easily distinguishable, and thus easier to remove than any other, and the more accurately the edges are coaptated the more rapid the union. Don't be afraid of multiplying sutures : when you sew, sew neatly. In turning back this mucus layer you very frequently meet with adhesions : these are generally easily torn by the exercise of a little tractive force ; but sometimes, as we find here, we have to use some instrument like a firm probe or the thin handle of a scalpel to separate them, and even then it is not easily done. Where the adhesions are thus extensive and firm, there is left a raw, sore surface all over the glans penis, which gives rise to a good deal of pain afterward ; it is indeed by far the most painful part of the whole proceeding. Having now completed the operation, you see the penis has a nice, neat appearance, looking very much as if the prepuce were simply retracted in a natural manner. All the dressing needed is a strip of oiled lint or linen and a cold-water bandage over it ; this is better than the wet bandage alone, which, if allowed to get dry at all, is apt to stick to the abraded surface of the glans penis and give pain. The mother is directed to keep this outer bandage wet with cold water, and to make the little fellow lean well forward when he urinates, so that no dribbling touches the sore part.

I have sometimes found it a good plan to put these little patients into a warm hip-bath when they wanted to make water, and let them do it in the bath, and thus avoid the contact of urine ; but sometimes they will not and cannot be made to urinate in this way.

We usually take out some of the sutures after forty-eight hours, and all of them in three or four days. If the child is very fractious, I leave the stitches alone, and, as they are very near the edge, let them come away themselves ; they are so fine that no marks result. Perhaps you smile, and say it is no matter if they do. Well, I say so, too.

Well, gentlemen, so much, and a great deal more than you expected, I dare say, for this simple, but important matter. No operation of a minor character that a surgeon frequently performs is more satisfactory and does more real good than this one of circumcision.

As I have already said, I think it ought to be done a great deal oftener than it is. And as what is worth doing at all is worth doing well, I have been thus particular in describing and demonstrating the method I prefer. It is a little tedious, but it is well worth all the time it takes in its neatness, quickness of recovery, and good results. I have never known any trouble, not even a considerable local inflammation, to follow it; all is generally perfectly well in a week. As you have just seen, there is no bleeding to amount even to an inconvenience. I have never seen any more than we have had in this case, in a child; but in adults I have known it rather free. It is comparatively seldom that we are called upon to operate for phimosis in the adult; and when we are, it is usually in cases of chancroids on the penis, where the phimosis results from inflammatory swelling of the prepuce, and has for its worst effects the imprisonment of the discharge from the venereal sores. In such cases surgeons are very loth to operate, and have generally done so, when they have, by simply slitting up the prepuce. Their reluctance, as you readily perceive, has arisen from fear of chancroidal infection of the wound: this generally takes place, and that, I think, from the unfortunate method of operating chosen. It seems to me that this infection of the wound would be much less likely to occur if a regular circumcision was performed, and the wound carefully protected. I operated, just as you have now seen me do, in a case of chancroid with phimosis not long ago, dressed the wound with carbolized oil, one part of carbolic acid in eight of oil, and enjoined the strictest cleanliness: no inoculation of the wound took place, and the sores showed that they had been aggravated and kept up by the pent-up secretions, by getting well very promptly.

II. HARE-LIP.

THIS young man, Edward S., aged eighteen, comes to us to be relieved, if possible, of the deformity left from either an imperfect or unfortunate operation for hare-lip, performed when he was seven years old. You see that near the middle of his upper lip, not exactly in the median line however, but a little to the left of it, he has a broad, ugly, disfiguring scar. Not only is the scar very wide, nearly a quarter of an inch, if not quite, I should judge, in width ; but the tissues of the lip on one side are raised considerably above the level of the lip on the other side of the scar, and, in addition, there is a quite deep notch or deficiency along the lower border or red margin of the lip. Take it altogether it is a very disfiguring affair, very little better than the hare-lip itself, and I do not wonder that the young fellow, now just of an age to take pride in his personal appearance, wants to have it remedied. We do not know, for the history does not enable us to judge, whether this untoward result is the fault of the physician who operated, or of the patient himself, or his parents, or whether it was simply unavoidable ; but I am glad of the opportunity of showing it to you, and giving you some practical remarks on the subject.

Operations for hare-lip are very common, but hardly ever very numerous in the experience of any one man, for it is not generally thought to be a matter of sufficient importance to require the services of one specially skilled in surgery, as it is supposed that any one can perform the necessary operation. As far as my observation extends, however, I am sorry to be obliged to say that too many doctors seem to think that all there is about it is to pare the edges of the fissure and secure a union, without paying sufficient attention to securing a result that shall leave as little trace as possible of the deformity. Nothing can be more inadequate than such an estimate of what should be aimed at, if not actually accomplished, in these cases.

Almost any tyro with the least care in the world can secure a union—indeed, he can hardly fail of that ; but to get such a union as shall leave no disfiguring scar or deficiency of the free border is often very difficult. I have no faith in some representations I know of in surgical books, where, with a “look on this picture, and then on that,” we are shown hideous deformities on one side, and beautiful and absolutely faultless faces on the other.

We must, in common honesty, confess that such gratifying and perfect results have not rewarded our efforts, nor have we ever *seen* them in the practice of others. But this is no excuse for carelessness, and we must try in every case to do the very best that care admits of, and this will tax our skill, and demand all our ingenuity and attention. Unfortunately, too, there are no rules that I can lay down that will serve for anything more than very general guides in the matter ; each case must be taken and studied by itself, and will require, to some extent, a special operation, not exactly like any other. For I venture to say that no two cases of hare-lip were ever quite alike in every detail and minutia, and oftentimes the very slight variations in the commoner forms of the deformity are more perplexing to the operator than the most complicated cases.

Hare-lip, as you are aware, is one of the deformities arising from arrest of development ; it is a congenital deficiency of the lip, resulting from a failure in the conjunction or fusion of the different parts of which the lip is formed. It seems to be a generally admitted fact that, at an early period of life, there exists, in the human subject, an intermaxillary bone, or rather a pair of intermaxillary bones, similar to what are found permanently in some of the inferior animals. Failure or delay of fusion of these bones, on one side or both, with the body of the maxillary, will determine the occurrence of hare-lip, with or without fissured jaw and palate, and explain also the reason of its occurring not in the median line, but to one side of it. Hare-lip may be simple : merely a fissure or

failure of union in the tissue of the lip itself, at a single situation, on one side or other. This fissure may be more or less complete. It may be a mere notch on the vermillion border of the lip, even so slight as to escape the notice of untrained observers, except as a personal peculiarity of form, or it may extend quite up to the nostril, or even a considerable distance within it, in which case the nose is flattened and spread out over the cheek, adding immensely to the deformity. A very curious modification of this malformation is sometimes seen, in which there is a scar the whole depth of the lip and a notch on the free border, as though there had been a hare-lip which had grown together in utero; whether this is really the case or not I do not know, but I think it very likely. Hare-lip may be double; that is, there may be a fissure on both sides of the median line, and a more or less V-shaped piece of lip between them. When this is the case, there is generally a more or less deep fissure of the gum and upper jaw, from want of union of the maxillary and intermaxillary bones, and sometimes great deformity is produced by the projection of the intermaxillary portion, so much so indeed that, if the case is not relieved, when the middle incisor teeth make their appearance they project horizontally from the mouth. In double hare-lip the fissure I believe is never of quite the same extent on each side, at least I never saw it so. Complicating hare-lip we have various deficiencies or fissures of the hard and other parts adjacent, such as the gums and jaw, as already mentioned, and also of hard or soft palate, or both.

But, as Mr. Bryant, of London, has remarked, the fissure of the hard or soft palate is never double, for anatomical reasons, already pointed out.

With all these separate elements of complication entering in, you can easily see that their possible combinations would give rise to varieties so endless, that it would be equally vain and useless to attempt to describe them all.

I have recently seen two remarkable cases which I will attempt to describe. In one of these there was a double hare-lip, with complete cleft palate ; the intermaxillary bone was completely unattached except by a pedicle just below the septum of the nose, and was so turned up as to completely occlude the nostrils, its inner or mucous surface looking directly outward and it was not till it was depressed with the finger, which could be easily done, that the central portion of the lip could be seen, as a little triangular flap attached to it. Great projection of this central portion is occasionally met with, but such a turning of it up I have never seen, nor do I remember any description or picture in surgical literature that corresponds exactly with it. The appearance of the child was repulsive in the extreme, nor was it till after some minutes' study that the precise nature of the case was made plain.

The other case was more curious still. It had an ordinary single hare-lip on the left side, with no fissure of gum, jaw, or palate. The cleft of the lip did not extend into the nostril, but quite up to its border. There was a wide separation of the lateral cartilages of the nose, without deficiency of integument, but with a deep sulcus or groove between them ; I should think the separation was quite half an inch. The child looked as though it had two noses, or a double-barrelled nose at the least. The effect was irresistibly comical.

These two cases are very extraordinary, unique for all I know, though it is rather a precarious venture to call any case unique ; and serve very well to illustrate the extreme variety met with in this deformity.

Sometimes the fissure of the lip extends upward and laterally into the cheek, and some of these cases present a most horrid appearance. Whether a similar deformity ever exists in the lower lip seems doubtful ; some of the books make mention of it, but I do not know of any well-authenticated case, and, for anatomical reasons, I should be inclined to think it doubtful.

Single or uncomplicated hare-lip is most common. Mr. Bryant found that, out of sixty-four cases, thirty-two were of this nature. My own experience would not be so favorable ; but it has been limited, and can have no significance one way or the other. As to its causes, that is, what determines the failure of union, in any given case, is unknown, and probably will always remain a mystery. That it is sometimes hereditary there seems good reason to believe ; at any rate cases have frequently occurred where it has existed in parent and child, and even in many members of the same family. Several authors make mention of such cases, and Dr. Gurdon Buck, of New York, has related an interesting example of the kind in the *Medical Record*.

Mr. Holmes says that in the cases he has met with it has always been the father and not the mother who has been affected. I have no experience to contribute on this point.

The fissure when single may be on either side of the median line ; most commonly, however, it is on the left side. For this no reason can be given, unless you call it a reason to say that deformities and deficiencies as a rule are more common on the left side than the right.

With regard to the influence of sex, Mr. Bryant gives us the only definite information with which I am acquainted. He says :

“ Out of sixty-four cases of hare-lip, forty-four occurred in boys, and but twenty in girls, or in the proportion of seventy per cent. of the former, and thirty per cent. of the latter, this deformity occurring forty per cent. more frequently in males than in the female sex.” I have no figures to guide me, but I should think my own experience would tally pretty exactly with Bryant's. Perhaps we may look upon this as a curious and fortunate instance of natural selection, as the male can hide any resulting scar by the growth of a moustache.

• The treatment of hare-lip resolves itself into the simple propo-

sition of paring the edges of the fissure, and causing them to unite in such a way as to produce the least possible deformity.

Such is the simple rule we lay down ; how difficult it may be of fulfilment I have already intimated to you.

Before going into a detailed description of the operation, we will proceed to operate on the case before us. This young man being placed under the influence of ether, I proceed to remove the scar tissue, including the whole line of vicious union, and reduce it again to the condition of a fissured or hare lip, in order that I may unite it in a better and more perfect manner. In doing this you will observe that I have not done it by making two *straight* incisions, one on each side of the cicatrix ; but that the incisions are slightly curved, their concavities looking toward each other ; the reason for this will be apparent in a minute. Having completed this step, I now take the two sides of the lip, and approximate them to see how they are going to fit ; in doing so I find that they do not come easily together, but I have to put them on the stretch, and use considerable tractile force to make them meet. This will never do ; so I proceed to loosen these two flaps, by dissecting them up from the cheek on either side. The commissure or reflection of the mucous membrane, where it passes over from the inside of the lip to the gums, is lower down than normal, and needs to be divided, and the lip loosened from the cheek.

This having been done, you see now that the two sides come easily and naturally together, without a particle of strain or tension.

We now proceed to join these two freshly-cut surfaces, and expect them to unite, or grow together, by first intention, just as any other cut surfaces would under favorable circumstances. The bleeding has been a little free, but it is now diminishing ; we need not wait for it to stop altogether ; indeed the coaptation of the edges is the best means of controlling it, and there is no great thickness of tissue, and a free surface on each side, so that the blood.

will all be squeezed out, and none of it left*to get between the edges and retard union. I now hold the edges of the lip together, and fit them as accurately as I can ; then I pass this silver-wire suture in about the middle, completely through and through on each side, and fasten it to begin with.

This is my main suture, or splint as I sometimes call it ; it gives firmness and steadiness to the whole ; it may be left in any length of time ; it is the first to be put in, and the last to be withdrawn. Now I put in a number of fine silk sutures which do not completely transfix the lip ; these are just close enough to one another to bring the skin edges accurately together, one very fine one in the prolabium, and we have done.

Leave the wound entirely open ; do not apply any covering or dressing to it of any kind. This, gentlemen, is all the appliance or dressing I have ever used, and all I believe to be necessary. These stitches may be taken out as soon as union takes place, one or two of them to-morrow or next day, the rest soon after, except the silver wire, which may be left several days longer, until union is quite firm.

We will now spend the rest of the time before us this morning in the discussion, separately, of the various points of this important little operation.

And, first, at what age should it be done? In regard to this question we meet with very contradictory opinions among authors ; some advocating its very early performance, say within a few days after birth ; others preferring to wait till the child has acquired some strength ; others again till it has completed its first dentition. I shall not trouble you with any citation of authorities on this point, but just give you my own judgment in the matter.

For the purpose of arriving at a just conclusion, it will be necessary to divide our cases into two classes : First, those, in which the deformity is simple or moderate, and does not interfere with the suction, and through that with the nutrition of the child.

Second, those cases in which the deformity is so great as to render it doubtful whether the child can take sufficient nourishment to maintain its vigor.

In the first class of cases I would rather avoid what little extra risk there may be in operating on a child a few days old, and wait two or three months, until the powers of life are fully established, all the functions set well a-going, and the process of growth in its first vigor. I do not see any necessity of waiting longer than this; children of this age, in my experience, bear operations equally well with those a little older. The formative and reparative processes are wonderfully active, and less scar results; you are now free from the inconveniences of dentition, and less likely to encounter the drawback of various infantile diseases than at a later period. And if there be cleft-palate, by operating thus early, while all the parts are soft and plastic, the pressure of the united lip will produce more or less approximation of the bony fissure; indeed, cases are not wanting where it has closed altogether under such circumstances.

For these reasons, then, if I had my own way, and there was nothing specially to contra-indicate it, I would never wait longer than three months before operating.

In the second class of cases, those in which there is such deficiency both of the soft and hard parts or other complications as to render it doubtful whether the child can be sufficiently nourished, operate at once, during the first day or two of life. I am sure I have twice made a mistake and lost my patients by waiting under such circumstances. I will never do so again. If you wait day after day, in the vain hope that the child will be a little stronger, you find that the contrary takes place, and when it once begins really to fail, there is almost no hope that it will then rally and improve. If it cannot suck either the mother's breast or a nursing-bottle, no spoon-feeding will bring it up. And, moreover, I have seen nothing to make me believe that an operation, as

severe as any for hare-lip is likely to be, may not be borne by a new-born child. I have performed operations quite as severe and protracted, such as for imperforate anus, colotomy, etc., with perfect safety. So I say do not delay and lose the opportunity of saving the child's life, but operate and take the risk, which after all we are probably disposed to exaggerate.

Another point: Shall we administer anæsthetics in these operations? Some authors forbid them, but apparently without good reason. I have always used them, and see no reason to discontinue the practice. Now, I almost invariably give ether for every purpose in surgery; but I see no cause to recall an opinion I once expressed as to the superior safety of chloroform in children over adults; though I would not say, as I then did, that it is absolutely devoid of danger. Either may be used if used carefully at any age, even within a few hours of birth; and the danger from blood running down the mouth into the respiratory passages may easily be guarded against with ordinary care. It used to be the rule that the child should be kept from the breast and fed with a spoon, for the first few days, till union took place, under the notion that the act of sucking would tend to draw the edges of the wound apart; but this is a great mistake, and you can easily convince yourselves, by trying the experiment with the tip of your finger, that the act of sucking really tends to approximate and press together the edges of the wound. The cries of the child, deprived of this its greatest and natural comfort, are much more to be feared.

In the operation itself probably the most important step is the thorough detachment of the lip from its osseous and other attachments, so that the edges, when freshened, may come completely and easily together without the least strain. Without careful attention to this, however well performed the other steps may be, a really good result is not to be anticipated. You noticed just now that after preparing the edges of the lip, at first they would scarcely

come together ; not at all without the exertion of considerable force ; but, after the free separation of the lip from the cheek, the parts could be coaptated with the greatest ease, and without any tension. This then is the first step of the operation ; in our operation it was not, but then this was rather different, for, in point of fact, we had to make our hare-lip first and then mend it afterwards. Sometimes this preliminary dissection has to be very free, but do not be afraid to make it free enough to accomplish your purpose.

Having done this, the next step is to freshen the edges of the fissure, as it is called. This consists simply in cutting or paring off the margin of the fissure all round, so as to present freshly-cut bleeding surfaces to one another in such a way that they may unite promptly and with the least possible deformity. There are several things I want to say to you about this, and, as the perfection of all these little operations about the face depends largely upon attention to details, I must ask you to pay attention to each point.

First, then, be sure to remove enough of the tissue on the edges ; you need hardly fear removing too much, you are very much more likely to err the other way.

You will often notice that the lip on either side thins off, or bends down, so to speak, at the edge, so that if you remove but a narrow strip, the union may be perfect ; but, owing to the fact mentioned, you will have a sulcus, or shallow, gutter-like depression along the line of your cicatrix. Go far enough back then to make your cut through the normal thickness of lip on each side, and you will then avoid one very disfiguring imperfection in the operation.

There has been a good deal said, one time or other, as to the instrument to be used in paring the edges : some insisting that scissors are best, and others contending as vehemently for the knife. I do not think it is a very material point, or one to dogmatize about ; but, for my own part, I decidedly prefer the knife, and

such a knife as you saw me use, a straight, sharp-pointed, narrow-bladed bistoury. Whatever knife you use, let it be exquisitely sharp, or you will find it difficult to make a smooth, even section. The lip is put upon the stretch by assistants, and, seizing the free margin at a convenient point with a mouse-toothed catch forceps, you transfix it with the knife at what you judge to be the proper distance from the edge, and complete this step by cutting first one way, then the other. I have seen recommendations to lay a wooden spatula under the lip, and then cut down on this with a scalpel, and also forceps so contrived as to hold the lip, leaving the portion to be removed projecting from their edges. Both these plans are unnecessary and bungling, and, as a general rule, it is best to discard every instrument in an operation that is not absolutely necessary and useful.

Now, as to the method to be pursued in paring the edges, to avoid the unsightly notch that is apt to be left on the border of the lip after the operation. Some operators disregard this, and simply pare the edges in a straight line, and unite them; this plan, of course, will be followed by the objectionable notch spoken of.

We can do better than this, and therefore we ought to do better. One plan that answers the purpose very well, sometimes, is the one you have just seen put in practice, to make the incisions slightly curved, with their concavities looking toward each other. The result of this is, that when the edges are approximated, the termination of the line of union projects slightly, like the natural projection in the centre of the lip, and, though it looks a little excessive, it is gradually moulded and shaped so as to present a very nearly natural appearance.

Another plan is to leave a part of the paring of the lip attached at one of the lower edges, and when the upper part of the fissure is united, it can be used to bridge over any notched deficiency that may be left below, being trimmed and shaped to fit with accuracy. This plan, which generally bears the name of Malgaigne, is a

very excellent one, especially in those cases of shallow fissure where the edges are very much rounded off below.

It requires some care and nicety in adjustment, but is well worth any extra trouble of this kind ; I have attained results with it that were as nearly perfect as anything could be.

There are some other and very elaborate forms of operation described in books ; but I merely mention them here, because I think that, whatever may be their excellences, they are hardly to be recommended for general adoption, and no descriptions or multiplications of method will meet the requirements of *every* case, much necessarily depending on the skill of the surgeon. With regard to the method of uniting the edges when properly prepared, I am firmly of the opinion that the best means, and the only one required, is the simple, interrupted suture. The so-called hare-lip pins are, in my opinion, an utter abomination here ; whatever else they may be adapted for, they are the worst possible thing in hare-lip operations. They are unnecessary ; they cause scars, sometimes very unsightly and disfiguring scars : the thread or yarn wound around them covers the wound, produces a scabby mass under which superficial ulceration goes on, and it leaves its mark behind it : they are not always easy to remove, and the attempt to do so may disturb the new union.

Of course, I think no better of bead sutures, and other ingenious incumbrances of a similar kind. As to the material of the sutures it does not matter much : neither wire nor silk will cut out if tension is taken off the flaps, and either silk or wire will cut out if the parts are on the stretch.

For my part, I mainly use pretty fine silk sutures quite close together, passing nearly but not quite through the lip. Only now and then, where there seems to be more resistance than usual, or the parts are uncommonly thick, as in the case before us, I put one silver wire suture through about the middle, as a sort of stay or splint.

When we have transplanted part of the pared edge across the free border, we need one or two very fine sutures to adjust it. Having secured the parts with the necessary sutures, do nothing more ; just leave it alone ; leave it uncovered, exposed to the air. Some advise covering the parts with collodion ; don't do it. Some supplement the sutures with adhesive plaster, which is certainly unnecessary if the stitches are sufficiently numerous ; it may prove irritating to the wound ; and, after the first few hours, at best, exerts but an infinitesimal influence in holding the edges together.

If, as will sometimes though rarely happen, the lip does not unite by first intention, but gapes open again, don't give up the effort, but reunite the now granulating edges with fresh sutures, and you will very likely get a union by second intention. Two points with regard to complicated hare-lip must not pass unnoticed. In double hare-lip it used to be advised to operate on one side only at a time, and wait until it united before undertaking the other.

This idea is now, I believe, pretty generally discarded—certainly it ought to be. There is no conceivable advantage in it, or objection to the contrary plan of operating on both sides at once. The V-shaped piece in the middle, considerably diminished, of course, by its double paring, can generally be fitted in nicely between the other two, and thus a better result is obtained, as well as the avoidance of the trouble and anxiety of a double operation. The bony projection that sometimes occurs, standing out more or less at a right angle from the mouth, is often very difficult and troublesome to deal with.

One feels sometimes sorely tempted to cut it off and get it out of the way ; but this is not advisable, if it can be avoided, for reasons hardly necessary to point out, such as loss of the middle incisor teeth, narrowing of the jaw, etc. The better plan is to seize it with a pair of strong forceps, such as tooth forceps, or necrosis forceps, whose blades have been protected with a covering of cloth

or chamois leather, and with gentle force bring it down to its place. It may partly break under the necessary force, but so long as it does not become detached this does no harm.

I have thus brought before you the main practical points in this important subject of hare-lip. I have not aimed to be exhaustive or exhausting, but to give you such general ideas as may be modified and adapted to suit the various cases you will meet with in practice.

Very complicated cases will need special devices and deviations that you must originate for yourselves. The principles to be borne in mind are : to free the lip thoroughly from its attachments so as to take off tension ; to pare the edge freely enough to get the whole thickness of lip in each flap, and so as to obviate, as much as may be, deformity at the free border, and to put in sutures enough to bring the edges thoroughly and evenly together, and to avoid, as much as possible, all elaborate forms of sutures and similar contrivances.

SPINAL IRRITATION: ITS PATHOLOGY AND
TREATMENT.*

BY

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THE cases before us serve very well as fair examples of an affection common enough, but which, for all that, is not so thoroughly understood as we could wish. It has been called spinal irritation, hysteria, spinal congestion, spinal exhaustion, neuralgia, and many other names, according to the views of those who have made it the subject of description. In my opinion, there is good ground for regarding it as consisting essentially in an anæmic condition of the posterior columns of the spinal cord, and, in accordance with that hypothesis, I shall here designate it, posterior spinal anæmia.

The disease is by no means a recently recognized condition. A hundred years ago it was described, and, under one or other of the terms mentioned, has attracted no small degree of attention from that time to the present day. Indeed, if the words spinal irritation, and especially posterior spinal anæmia, are uttered in the hearing of some individuals, an effect is produced very much like that which results from flaunting a piece of red flannel in the face of a mad bull, or singing an obnoxious political song into the ears of a member of the opposite faction. But we have here no-

* A Clinical Lecture delivered to the medical class of the University of the City of New York, October 26th, 1876.

thing to do with antipathies of that kind, and if you care as little for them as I do they will not materially disturb your equanimity. I think I shall be able, in the course of the present lecture, to convince you that there is really such an affection as spinal irritation, and that there are more and better reasons for regarding it as due to anæmia of the posterior columns of the cord than can be adduced in favor of any other pathological hypothesis. Beyond that it is, in the present state of our knowledge, impossible to go.

And I would beg you to remember that, however desirable it may be to elevate medicine, in all its departments, to the rank of an exact science, it has by no means yet attained to that position, and in all probability never will. We are obliged to rest almost all our opinions and actions as physicians upon what is really circumstantial evidence. Lawyers and others accustomed to investigation, and to determine the value of testimony, will tell you that this kind of evidence is often better calculated to lead to true deductions than the so-called positive evidence of the senses. In other words, it is more probable that the senses will deceive us than that a category of circumstances, all pointing in one direction, should be false in their indications. People, fortunately for themselves, however unfortunately for medical positivism, rarely if ever die of spinal irritation, and we do not therefore often have the opportunity of making *post-mortem* examinations of their spinal cords. Even in the few cases of such examinations made of persons dying of other diseases, while suffering from spinal irritation, the results have been entirely negative; and this is just what we should expect, if the view of its patho-anatomy is correct which I have been led to entertain. Now, from all this it follows that we must, at least for the present, look to circumstantial evidence, to that mass of concurrent testimony afforded by the study of the physiology of the healthy nervous system, and the phenomena exhibited by analogous and more easily investigated diseases, for the facts upon which to construct a rational hypothesis of the

real nature of spinal irritation. If any one can supply more positive data than can be obtained from this source, let him do so. In the mean time we have only to remember that denial is not proof, and that invective is not argument.

But, before proceeding to the discussion of the patho-anatomy of the disease in question, let me briefly recall the chief symptoms observed in these patients, and in others similarly affected, which have from time to time been brought to your attention. It would be too much to expect that each patient should exhibit in her own person the whole category of morbid phenomena which go to make up the pathological entity called spinal irritation. The spinal cord is a long organ, and while one part may be the seat of disease, the others may be comparatively healthy. We will see, however, that the differences in the symptoms, as manifested in the various cases which come under our notice, are, in the main, such as are the results of different sections of the posterior columns of the cord being the seats of the lesion.

The symptoms of spinal irritation are both centric and eccentric. The centric symptoms are those which are exhibited by the diseased part of the cord, or its immediately contiguous structures; the eccentric, those which are developed in remote parts of the body. Of the former, pain, excited when pressure is made on the spinous processes, or on either side of them over the affected part, is the essential phenomenon. However much the other symptoms may vary, this is, in my experience, always present. It is sharp, lancinating, and remains for a minute or more after the pressure is removed. The other abnormality of sensibility, spontaneous pain, is not so constant a feature, though very few cases fail to exhibit it at some time or other of their course. It is dull and aching in character, and is increased by either mental or physical exertion. Indeed I have known cases in which it was produced instantly by emotional disturbance. It is probable that in those cases in which pain is excited or aggravated by muscular exercise, the fibrous

structures external to the cord are its seat ; while in those in which it follows an intellectual or emotional cause, the situation is in the cord itself.

Excuse me if I dwell a little on the fact of the capacity of the spinal cord to experience pain from mental disturbance. When we come to the consideration of the pathology of the disease under notice, I shall return to this point, and we will then see how strong an argument it constitutes in favor of the view of its nature which I have mentioned.

Neither of the patients before us exhibits this symptom, but a lady consulted me a few weeks ago in whom it was a most troublesome feature, the slightest degree of anxiety, the least *contre-temps* in the course of her every-day life being sufficient to produce a dull, aching pain in the spine between the shoulders, from which she was only relieved by a good night's rest. The fact of pain in the spine being thus induced was noticed by the brothers Griffin* more than forty years ago.

The eccentric symptoms are far more numerous, and they vary greatly, according as one or other region of the cord is affected ; sensibility, motility, and visceral functions are all more or less disturbed. Thus, if the seat of the morbid process is in the cervical region, there may be vertigo, headache, noises in the ears, disturbances of vision, tenderness of the scalp, a sensation of fullness in the head, or of constriction across the forehead, neuralgic pains in the scalp, face, neck, shoulders, upper part of the chest, and in the hands and arms, and occasionally, though not often, numbness in some one or other of its several forms.

Motility is deranged either as regards excess or diminution, or at times one and again the other, giving rise to an alternation of paralysis with spasms. Thus there may be loss of power in some one or more of the cerebro-spinal or upper spinal nerves ; fibrillary

* Observations on Functional Affections of the Spinal Cord, etc., London 1834, p. 206.

contractions ; clonic spasms of the muscles of the face, extremities, or upper part of the trunk ; contractions of the superior extremities, lasting sometimes for long periods, and again suddenly disappearing after a very short duration ; aphonia, and hiccup.

The mind may be affected to such an extent as to constitute actual insanity, sleep is almost invariably deranged, usually insomnia being produced, sometimes somnolence. The dreams are generally unpleasant, and there may be a tendency to somnambulism exhibited.

Occasionally there is excessive salivation, and again the mouth and tongue are parched. Nausea and vomiting are generally excited when any substance is taken into the stomach, and may be so severe and persistent as to lead to grave apprehensions for the life of the patient. Palpitation of the heart and irregularity of its action are also occasional phenomena.

In some cases the phenomena are still more general than any I have mentioned. Thus there may be epileptiform paroxysms, or choreiform movements beginning in the muscles of the face or superior extremities, and extending to other parts of the body.

When the dorsal region of the cord is the seat of the disease, as shown by tenderness, on pressure, existing over some part of its course, the symptoms are only different because different parts and organs are implicated. Thus there are gastralgia, infra-mammary pain and intercostal neuralgia, nausea, vomiting, pyrosis, gastric flatulency and acidity, palpitation of the heart and attacks of syncope, difficulty of breathing, cough, epigastric pulsation, pain in the heart simulating angina pectoris, and asthma.

The lumbar region when affected gives rise to fully as notable symptoms as any that have been mentioned. There are neuralgic pains in the lower extremities, the uterus, the vagina, ovaries, intestines, or muscles of the back or abdomen, and, in the male, in the testicles.

The neck of the bladder is sometimes affected with spasm and pain, causing great difficulty in urinating, or there may be incontinence of urine from paralysis of the sphincter, or inability to pass water from paralysis of the bladder. The lower extremities may be the seat of tonic or clonic contractions, or of paralysis, and the knee or hip joints may put on the semblance of organic disease.

The cord throughout its whole length may be involved, and then the symptoms are more or less generalized, or any two of its divisions may be affected, and then there is a corresponding increase in the area of the resultant phenomena. To consider the symptoms of spinal irritation in detail would take up more time than one lecture affords. Indeed, I have not even mentioned them all. Enough, however, has been said to indicate to you pretty clearly their general characteristics and import.

And now in regard to the pathology of this very remarkable affection.

In all cases in which the patho-anatomy of a disease cannot be positively ascertained, we are warranted in constructing a hypothesis of its real nature from such data as are at our command. It is better to do this, even if the view we enunciate is not absolutely sufficient to account for all the observed phenomena, than to shut up our opinions in our own minds, or, worse still, form none whatever. An erroneous doctrine or theory is better than that silence of mental hebetude which neither excites discussion nor prompts to further investigation. The drones and the dullards sit quietly with folded hands waiting for "something to turn up," till some one bolder and more searching than they pitches a hand-grenade, in the shape of a new theory, into their midst, when sad indeed is their condition if they do not at least unite in an attack on the assailant. From the resulting contest only ultimate good can come. The theory is sifted, its pretensions are confirmed or exposed, new facts are adduced, and in the end there is a positive

advance of science. As to the personal abuse that may pass between the combatants, that is a small matter. A man is probably neither better nor worse for holding any view he chooses relative to the pathology of spinal irritation.

In another place* I have given full details relative to the views of other authorities on the subject of the pathology of the disease in question. As there stated, my own opinion is, that it is due to anæmia of the posterior columns of the spinal cord; but, as this hypothesis has been called in question, it is, perhaps, only proper that I should state the reasons for the belief somewhat more at length than heretofore.

1. It is said that the spinal cord is not liable to be rendered anæmic unless the whole system is in a like condition. This proposition is put forward by, among others, my friend Dr. Bauduy,† of St. Louis, in his very excellent volume on diseases of the nervous system, and by certain anonymous writers. "I must confess," says Dr. Bauduy, "that I cannot understand these limited conditions of anæmia, any more than I can those momentary congestions of the brain which play so great a part in the diagnoses of many physicians." But does Dr. Bauduy, or any one else, understand why a congestion should at times be limited to the mucous membrane of the fauces, or the conjunctiva of one eye? Do we understand why the emotion of shame should produce congestion of the skin of the face—blushing—or why fear, instead of making the whole body anæmic, should have its effect also limited to the face, producing a death-like pallor of that part of the cutaneous surface? Is there any more reason why disease should be restricted to the stomach, or intestines, or to one lung, or kidney, than to the spinal cord? These, and hundreds of other instances, are for the present ultimate facts. When they are explained it

* A Treatise on the Diseases of the Nervous System, sixth edition, 1876, p. 386 *et seq.*

† Lectures on Diseases of the Nervous System, 1876, p. 308.

will be time enough to ask why the spinal cord should be the seat of a special anæmia.

That general derangement of the health accompanies most cases of spinal irritation is certainly true. We have seen how the brain, the heart, the lungs, and the digestive system are liable to be involved. Such disorders are, however, the consequences, not the causes, of the spinal trouble, and when the latter is cured they disappear.

2. Again, it is alleged that the spinal cord is of such small diameter throughout its whole length that it is impossible for the posterior columns to be anæmic without all the rest of the thickness of the organ being similarly affected. Now, the spinal cord is like the brain, a compound organ. It has various functions, as it has various distinct anatomical parts. There are seven of these divisions in each lateral half of the cord, as you will notice from an inspection of the diagram before you; and each posterior column, is in reality composed of two anatomically, physiologically, and pathologically separate parts. Recent investigations have shown us that a disease, the existence of which will probably not be questioned—locomotor ataxia—is essentially located in one of these parts, and that the other may remain unaffected. Locomotor ataxia is due to an organic change in the nerve tissue, and this change is detectable by microscopic examination after death. In one such case, investigated very thoroughly by Pierret, the posterior root zones, the more external of the two divisions of the posterior columns, were found to be diseased, while the columns of Goll, the more internal divisions, were unaffected. It has also been shown by Pierret that the columns of Goll may also be the exclusive seat of disease.

Now, if these things are true—as they certainly are—of the separate parts of the posterior columns, why may they not be true of the whole columns? Locomotor ataxia is a terrible disease, and yet it may be restricted in its location to a portion of the spinal cord less than one-tenth of its entire thickness.

Again, we have diseases of the cord restricted to the antero-lateral columns, to the anterior horns of gray matter, yes, even to a single group of cells of one horn, all the rest of the cord remaining healthy, so far as the phenomena observed during life and the most minute *post-mortem* examinations are capable of teaching us.

And what is true of the spinal cord is true of other organs of the body. There is not one which may not be the seat of a morbid process in some exceedingly limited part, while the remainder of its tissue presents no evidence of disease. Indeed, the reverse is the exceptional condition.

In view of these facts, it strikes me that those who assert—and it is mere assertion—that anæmia cannot be limited to the posterior columns of the cord forget some very obvious analogies with which they ought to be familiar.

3. The symptoms of spinal irritation are more certainly referable to anæmia than to any other condition. Irritation, or an undue susceptibility to be impressed, is the best evidence we have of weakness, and weakness means defective nutrition, or, what is the same thing, a deficient supply of healthy blood. Thus, an anæmic retina cannot bear the full light of day; an anæmic heart beats with great rapidity; a weak stomach rejects the food which enters it; an anæmic brain aches, and the pain is relieved by stimulants; weak muscles tremble on the slightest physical exertion, and an exhausted generative system is brought into an unnatural state of erethism by excitations which in health would be unfelt. Even the irritable mind is more frequently the result of an exhausted or badly-nourished brain than of any other cause. It is, therefore, strictly within the bounds of analogy that an irritable spinal cord should be the seat of pain, and that organs in anatomical relation, through their nerves, with such a cord should exhibit indications of morbid sensibility.

As regards this latter point, we have additional proof in the fact that pressure made upon the painful spot will frequently produce

pain, motor derangements, or visceral disturbance in those parts or organs deriving their nervous supply from that part of the cord. In a young lady, who was the subject of spinal irritation at the level of the sixth dorsal vertebra, pressure on that spot always induced nausea and vomiting. In another, in whom the disease was similarly situated, pressure over the painful part excited intense pain under both mammæ.

4. Upon the principle of exclusion we are justified in assuming the patho-anatomical feature to be anæmia, for there is no other known condition which could give rise to the phenomena. The symptoms of other affections of the spinal cord are well known, and are for the most part exceedingly definite in their indications. The alterations in the nerve structure, to which they are due, are easily detectable after death, and hence groups of symptoms are readily associated with well-known lesions.

5. The suddenness with which spinal tenderness may be developed indicates with great positiveness a disturbance due to vascular derangement of some kind. The brothers Griffin* refer to cases of spinal tenderness suddenly induced by alarming news or other emotional cause, and accompanied in one instance by spasm of the stomach, in another by menorrhagia, in a third by ischuria, etc.; and I have already cited a similar case among others occurring in my own experience. Now, I think it is more reasonable to ascribe the cause of the pain in the cord and the visceral troubles to anæmia, suddenly induced by vaso-motor spasms of the spinal vessels, than to attribute it to any other factor. The only other possible one is congestion, and this, if limited to the posterior columns, would induce anæsthesia, not pain, just as we see it does in the very earliest stage of locomotor ataxia.

We frequently see cases in which sudden emotional disturbance has produced headache. The pallor of the face and the facts that the recumbent position and some cardiac stimulant, as a glass or

* *Op. et Soc. cit.*

two of wine, afford speedy relief, very clearly show us that the intra-cranial condition is anæmia. The pain in the spinal cord and the accompanying phenomena are equally effectually cured by similar means.

6. The actions of certain medicinal agents, when administered in cases of spinal irritation, point out to us the nature of the spinal disorder. Thus, those medicines, such as strychnia, phosphorus, and picrotoxine, which increase the amount of blood in the cord, are the remedies which are most effectual in combating the disease; while others, such as ergot and belladonna, the action of which is to diminish the amount of intra-spinal blood, invariably aggravate the symptoms. The fact just alluded to, relative to the relief which, in cases of spinal irritation, follows on the assumption of the recumbent posture, points in the same direction. Such patients are always better after they have been lying down. On the other hand, an individual affected with congestion or inflammation of the cord always experiences an increase in the intensity of the phenomena while lying down and for a time after rising.

7. The promptness with which certain functional derangements disappear, when local applications are made to the affected region of the cord, indicates that this latter is the primary seat of the disease. In an interesting lecture, forming one of the present series, my friend, Dr. Jewell, takes the view that the spinal trouble, even when located in very limited regions of the cord, is the result, not the cause, of the functional derangements of other organs so generally observed as accompaniments. But, according to my experience and that of others who have studied the subject, the very reverse is the case, and upon no other hypothesis can we explain the immediate relief which follows in many cases the application of counter-irritants to the skin over the affected region of the cord. Thus, last summer, I was requested to go to New Jersey, in consultation with Dr. E. W. Lambert, of this city, to see a young lady who, for several weeks, had been vomiting incessantly, till at

last her life was despaired of. I found her reduced almost to the last extremity, for, to all appearance, she had not many hours to live. Everything taken into the stomach was at once rejected, the skin was cold and clammy, the pulse a mere thread; she could scarcely speak, even in a whisper, and I thought she would sink through the exhaustion induced by the movements of the body necessary to enable me to make the requisite examination of her spine. Tenderness was discovered at the very uppermost part of the cervical region. I applied the actual cautery freely to this part, gave morphia hypodermically, and alcoholic stimulants by the rectum. The vomiting ceased at once, and the next day Dr. Lambert found that her stomach was capable of retaining small quantities of warm stimulating drinks. Recovery was rapid and complete.

In another case, that of a young lady from the British province of New Brunswick, no means sufficed to stop the almost constant vomiting, till a large blister was applied to the tender region of the spine, and then the relief was prompt and complete.

Now if, in such instances, the gastric disease had been the primary trouble, by what reasoning could we explain the fact that it was cured by counter-irritation to the spine? Clearly such cases, if they teach us anything, go to show that the primary disorder is in the spinal cord. Dr. Jewell expresses doubts as to this condition being anæmia, and ascribes it in part to "defective nutritive supply." But in what respect this differs from anæmia I do not know. To my mind they are one and the same thing.

8. Now, supposing that the disease is situated in the spinal cord, and that it is anæmia, what warrant have we for going further, and placing it mainly, if not altogether, in the posterior columns?

To answer this question we must, in the first place, consider the normal physiology of the posterior columns, and in the next, the bearing of the phenomena which are manifested in cases of spinal irritation.

The posterior columns consist of the white matter in each lateral half of the cord lying between the posterior median fissure and the posterior horn of gray matter. They are divided into two parts; the columns of Goll lying on each side of the posterior median fissure, and the posterior root zones, the external boundary of which is on each side the posterior horn of gray matter. By referring to the diagram before you, you will see these divisions represented on a greatly enlarged scale.

As regards the physiology of these columns, experiments performed on living animals uniformly go to show their intimate relation with sensibility. In regard to this point, I cannot do better than quote the remarks of my friend Professor Dalton.*

“What parts of the spinal cord are sensitive or excitable under the influence of artificial stimulus?”

“When the spinal cord is opened in the living animal, the first portions of the cord which present themselves for examination are the *posterior columns*. The irritation of these columns by artificial stimulus, according to the united testimony of all observers, produces evident signs of sensibility in the animal. It is also found by experimenters generally that this sensibility is most marked in the immediate neighborhood of the attachment of the posterior nerve roots; while at the greatest distance from this point, namely, at the inner edge of the posterior columns, on each side of the median line, their sensibility may be nearly absent. It is evident that the sensibility of the posterior columns is largely due to the presence of fibres of the posterior nerve roots which may be included in the irritation, and many of which traverse the outer portion of the posterior columns horizontally in their passage toward the gray matter. The only discrepancy on this subject is in regard to the question whether the fibres of the nerve roots are the only sources of sensibility for the posterior columns, or whether the longitudinal columns themselves are also sensitive. According to

* Human Physiology, sixth edition, 1875, p. 449.

some authors (Van Deen, Brown-Séquard, Poincaré), the posterior columns have no sensibility of their own, but only what is due to that of the posterior nerve roots ; since, if these roots be torn out, irritation of the posterior columns no longer produces any perceptible sensation. In the experiments of Schiff and Vulpian, on the other hand, the posterior columns, after being divided by a transverse section, and then separated from the adjacent parts for a distance of several centimetres in front of the point of section, still indicate the existence of sensibility when subjected to irritation. Irritation of the posterior columns, like that of sensitive tracts generally, produces also movements in various parts ; but these movements are reflex in character, and are simply the signs of an irritation communicated to the nervous centres."

Of course, pathologically it makes no difference whether the pain experienced in the cord, as a consequence of irritation, is due to the presence of the posterior nerve roots or not ; for these are, in reality, an integral part of the posterior columns—of that portion which we now call the posterior root zones.

The fact that anæmia of nervous tissues causes pain in them, and is therefore a source of irritation, has already been shown, and will perhaps scarcely be questioned by any one. It is a law that irritation existing in a nerve centre gives rise to pain in those parts which are supplied by nerves coming from the irritated portion. Now, we have only to reflect that pain is the chief expression of spinal irritation, and we will have no difficulty in understanding the relation existing between the disease in question and anæmia of the posterior columns of the spinal cord. In fact, spinal irritation and anæmia of the posterior columns of the cord are, so far as we can see, the same thing.

Take the cases before us. Both have spontaneous pain in the upper dorsal region of the spine, and in both a sharper and different kind of pain is developed on pressure over the third and fourth dorsal vertebræ, which radiates to both sides of the chest ; both have

infra-mammary pain and intercostal neuralgia : both have nausea and vomiting as common phenomena on the ingestion of food into the stomach, and both have involuntary twitchings of the muscles of the upper extremities. In these and similar cases, in which there are visceral derangements and spasmodic movements, these are reflex in character, and in those others in which there are paralysis and tonic muscular contractions, the morbid action probably extends to the lateral columns.

From all these points, it appears to me that the pathology of spinal irritation is as clearly made out as that of any other disease in which we do not have the opportunity of making *post-mortem* examinations, or in which, having such opportunities, the lesion remains undiscovered. In all such cases—and there are not a few, epilepsy, chorea, and hysteria and its analogues being among them—pathologists differ. It is better, however, as I said before, to have an erroneous opinion than none at all. If the one I have brought before you be wrong, let the fact be demonstrated, and I promise you it will go the way of many more which I and others who work have had to part with.

In regard to the treatment of spinal irritation, I have very little to add to the directions you have often heard me give in cases similar to these before us to-day. These, as you know, relate to the removal of the cause, the improvement of the general tone of the system, increasing the amount of blood in the spinal cord, and the setting up of a counter-irritant action in the immediate vicinity of the painful region of the spine.

The first indication is one which common sense teaches relative to all diseases, the cause of which is still in operation. It will very generally be found, in cases of spinal irritation, that there is overwork, or defective nutrition, or improper hygienic factors of some other kind, which must be overcome before success is possible. Sometimes the exciting influence is emotional, and this is usually most difficult to subvert. It is astonishing how very greatly emo-

tional disturbance affects the disease in question, for better or worse, according to its character. It would appear, in many cases, that the spinal vessels are like those of the skin of the face, contracting and dilating according to the kind of emotion acting upon them. Emotions of a depressing character certainly aggravate the disorder, while those which are exhilarating diminish the intensity of all the symptoms. Sometimes we find it impossible to change the current of morbid feeling, and then we will assuredly find our remedies fail of their full power. There are no salves that will heal a burnt hand, if the patient keeps sticking the member in the fire.

The general tone of the system is to be improved by the use of tonics, such as iron, quinine, the mineral acids, and cod-liver oil. In some cases iron, though indicated, is badly borne, causing gastric disturbance and headache. In such instances manganese—the sulphate, for instance—may be substituted in corresponding doses.

The amount of blood in the spinal vessels may be increased by strychnia, phosphorus, and opium. I am very much in the habit of giving a prescription, in cases such as those before us, which generally acts very happily. It is : \mathfrak{R} Strychniæ sulph. gr. i. ; quiniæ sulph. ; ferri pyrophosphatis aa ʒi. ; acidi phosphorici dil. ; syrupus zingiberis aa ʒij. M. fl. sol. Dose—a teaspoonful three times a day, in a third of a tumbler of water, after meals. It should be taken persistently for a month or more.

Opium is a remedy of great power in spinal irritation. It acts with even greater effect than it has been shown to do in cases of cerebral anæmia ; to obtain its maximum influence it must be given in full doses two or three times a day. The entire drug is, I think, preferable to any one of its constituents ; a pill of a grain may be taken morning and night.

Latterly I have made considerable use of picrotoxine in the treatment of cases of spinal irritation. Its action seems to be very like

that of strychnia, and it appears to exercise a decidedly beneficial influence in improving the nutrition of the cord. Experiments made several years ago by Orfila and Dr. Glover established the fact that this substance is a powerful cerebro-spinal excitant; and my own observations and experiments with the substance, an outline of which you will find in the October number of the St. Louis Clinical Record, go to establish the same fact. I cannot say, however, that it has any especial advantages over strychnia. It may be given in doses of from the one-hundredth to the fiftieth of a grain three times a day in pill. Such doses do not, however, produce any twitchings or rigidity of the muscles, very much larger quantities being necessary for such results.

Alcohol, in some form or other, is an article of food which cannot well be done without; but which is of course liable to be abused. I am sorry it is so, but if we dispense with its use we do so to the disadvantage of our patients. The form may safely be left to individual taste or peculiarity; but as a rule it will be found that the stronger liquors, whiskey, brandy, rum, and gin, agree better with the stomach than wines or malt beverages.

In regard to the counter-irritation, blisters are, upon the whole, the best form, though at times the actual cautery acts with astonishing promptness. The former should be large, eight or ten inches long by three or four wide, and should be placed immediately over the painful region of the spine. If there is more than one tender spot, or if the whole spine is painful, they should be applied one at a time at intervals of five or six days, and should be renewed as often as may be necessary. In general, vesication is not pushed to its proper extent.

The actual cautery is more readily applied and is less painful than a blister. The platina button-pointed cauterizer may be used, the instrument being brought to a white heat in a blast lamp or a Bunsen's burner, and the skin on each side of the painful spot touched with it three or four times in a line; or the cauterizing

apparatus made by Upham, of Boston, may be very advantageously used in the same way. The operation should be repeated if necessary.

Relative to the comparative advantages of the actual cautery and blisters, the former is to be preferred when an immediate effect is required. It sometimes acts with a degree of promptness to which no other application can attain, and while you are waiting for a blister to draw your patient may die. Nothing can thoroughly take its place in such cases. The mushroom vesication produced by aqua ammoniæ and such like substances is of little or no avail. But the cautery fails more frequently than Spanish fly blisters, for the reason, probably, that it acts too rapidly to act amply. In the case of the young lady from New Brunswick, to whose case I have alluded, the actual cautery was used over a dozen times all around the tender region of the spine, and yet no curative effect was produced ; and after all, blisters did the required work in the most satisfactory manner. Therefore, unless there is imperative necessity for haste, blisters are to be preferred.

In addition to these therapeutical measures, there are others of a more strictly hygienic character which require to be enforced. The air ought to be pure, the food nutritious, and the surroundings of the patient cheerful. Exercise should be taken daily in the open air, if the patient be able ; but fatigue should on no account be incurred. It is better not to exercise than to become tired.

The recumbent position, by allowing the blood to gravitate to the spinal vessels, is always more comfortable to the patient than any other. It should therefore be kept during the greater part of the day, both as being more agreeable and as tending to facilitate the cure.

By the use of such measures as these we rarely find a case of spinal irritation which resists treatment. And I think I can promise that the two women before us will be materially better by

next Thursday, under the influence of the mixture prescribed, two or three glasses of porter daily, and an ample blister over the upper dorsal region of the spine.

It is necessary to address special attention to the stomach when there is such persistent vomiting as is present in some cases of spinal irritation. You will find in such instances, when they are extreme, that nothing stays on the stomach, even the blandest and most easily digested substances being immediately rejected.

Now you can often accomplish a great deal by requiring that the diet should be of the simplest possible character, and that only very small quantities should be taken at a time. If the patient cannot retain a tablespoonful of milk or beef tea, try a teaspoonful; and if this is thrown up, give half a teaspoonful. Even the smallest quantity that can be kept down is better than a larger quantity thrown up; and when once a lodgment is effected, the portion may be repeated in half an hour, and so on till you will find that during the day no small amount of nutriment enters the system.

I learnt a very important point from Dr. Lambert, in this: that warm liquids are often more apt to be retained than cold ones. Since seeing the case with him in New Jersey to which allusion has been made, I have very frequently with great advantage substituted drinks as hot as could be swallowed for the ice-cold fluids that had been ingested only to be promptly vomited.

Among medical means, I have never used anything comparable to the valerianate of caffeine, which may be given in doses of from three to five grains as often as it appears to be required. Its only objection is its great cost. In a very obstinate case which I saw recently in consultation with Dr. Whybrew, every noted medicine had been tried without effect, when a couple of doses of the valerianate of caffeine at once arrested the vomiting.

In my experience, the preparations of cerium, however useful they may be in the vomiting of pregnancy, are inefficacious in that of spinal irritation.

One word further, relative to the efficacy of electricity :

The galvanic current, used directly to the spine, is often a valuable agent in the treatment of the disease in question ; but I do not think it can advantageously replace blisters, and it is difficult to use both. There are cases, however, in which, from one cause or another, vesication cannot be practised without inconvenience, and then a current strong enough to redden the skin may daily, for a few minutes each time, be applied to the painful regions. The electrodes—wet sponges—should be drawn gently over the skin on each side of the spinous processes, or one—no matter which—may be held stationary while the other is moved. Some authorities contend that the current in such cases passes through the cord ; but this is at least doubtful. It probably acts either as a dilator of the vessels through the vaso-motor nerves, or like any other counter-irritant.

The faradaic current appears to me to be useful when applied to the weak muscles of the back or other parts of the body, and in this respect to be superior to the galvanic current. Both may be advantageously used—the latter interrupted—to overcome the contractions in muscles which are occasional complications of spinal irritation, and the neuralgic pains may often be temporarily dissipated through their employment.

Understand, however, that electricity is only an adjunct ; and that to depend upon it, to the exclusion of the other means mentioned, would subject both you and your patients to disappointment.

THE TREATMENT OF ECZEMA.

BY

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WE are particularly fortunate to-day, gentlemen, in having a number of cases which, taken collectively, present the main and most important indications for the treatment of eczema. We have in previous lectures considered, at sufficient length, I trust, the clinical history of this very prevalent affection; and as I have shown you examples of its various stages and phases, I shall not have to repeat now much of what was then said. You undoubtedly will remember that I told you that the treatment was in reality very simple when the cases were thoroughly studied, and when the indications, therefore, were fully and accurately drawn out. Indeed, though much is said as to the difficulty of treating eczema, I think that the great stumbling-block has been the want of a thorough knowledge of the nature of the affection and of the various phases which it presents; for if these are clearly mastered the treatment is simple, and in most cases, I think I may say (though of course there are some exceptions), attended with excellent results. Perhaps this, more than any other affection of the skin, has been treated by physicians in a routine manner, without that correct appreciation of the indications as presented by each case which I have told you is so necessary. This fact will be forcibly illustrated by the cases now before us. I will present

their history and clinical features in a brief but complete manner. This woman, Mrs. M., aged 42, is, as you see, strongly built, and a person of seemingly excellent nutrition. She is the mother of several children who have never, thus far, shown any evidence of skin affections, and she herself never suffered from her present difficulty until three years ago, her youngest child being now six years of age. Her eczema, for that is her trouble, began in the winter of 1873 as a small patch upon the leg, which was swollen from varicosity of the veins. The affection then was limited to this leg, and only involved the lower third, beginning at the ankle. She was cured of this eruption, and was free from any until the next winter, when both legs were involved as well as the hands and forearms, chiefly on the flexor surfaces. In the winter of 1875 she was scarcely troubled, but now in the early spring months she comes in a worse condition than she has yet experienced. You observe that her face is greatly swollen, the eyes nearly closed, and that her arms are wrapped in pieces of linen. The skin of the whole face is red and much thickened. Beginning at the margin of the hairy scalp, this condition extends well down the neck upon the shoulders. The arms, as far as the elbows, including the hands, are similarly affected, and she is unable to move the fingers. On the chest is a large number of groups of papules having an irregular area of about half an inch, and I am told that the whole body is similarly affected. Examined closely we find much infiltration with only very slight scaliness, and that on the forehead, cheeks, and hands. The balance of the patches are simply reddened, for the most part papulated skin. This papulation is well marked here on the neck and on the hands and cheeks, but in many spots it is absent, as you observe. Even if looked for with a glass you do not observe vesicles or pustules. The eruption is accompanied with a burning itching, which is described as very severe. The woman says that she has always been healthy, never having any disease, and that while

afflicted with eczema in former years she has not been sick. Her family history is likewise free from any evidence of sickness, and none of her relatives have suffered from rheumatism, gout, or skin affections. Her history of the present outbreak is, that she thought she had taken cold, and on going to bed the night before last the skin under her eyes felt hot and tender. In the morning, having been very feverish during the night, her whole face had become swollen, and since then the affection has involved the parts mentioned—as you see, a large portion of the whole body. Such then is the history, and our diagnosis is readily made by a consideration of it; but such a case is liable to be looked upon either as erythema or erysipelas. In erythema the redness is of a more decided pink; here you see it is of a dull red, and there is, as a rule, rather less infiltration, and the antecedent symptom is of a burning nature rather than a burning and itching. There is not this characteristic papulation. The main diagnostic points are the difference in the shade of redness, and in the amount of infiltration. As you gain familiarity in the recognition of skin diseases, you will become able to say at a glance which is a case of eczema and which one of erythema. In many cases of eczema of this form, there will be seen scattered papules, vesicles, and even small pustules, which will render your diagnosis certain. Then again the early appearance of desquamation is peculiar to eczema. The well-known pinkish-red color of erysipelas, its tendency to spread by its periphery, and usual limitation to one spot, are points which, if remembered, will exclude the suspicion of that disease in an examination like the present. This then is a case of nearly general acute erythematous and papular eczema; You will remember that I told you that the most correct and simple division of eczema was that which recognizes an erythematous, a papular, a vesicular, a pustular, and a form called eczema rubrum or madidans, in which there is a serous exudation. I told you also these forms were seldom seen to run an uncomplicated course,

but that they were often mixed together, and the one ran into the other, as we may often see. The chief lesion in this instance is erythema, but, as I have said, there is some considerable papulation. Returning to the examination of our case, we find that the patient has a quick pulse, a furred tongue, is constipated, and that her digestive processes are out of order, as she says she is "bilious and feverish." Let us now consider the treatment, local and internal. First the local; and here let me impress upon you an important fact, and that is, that in the great majority of such cases as this, ointments and all fatty preparations are contra-indicated, as they are injurious. I cannot insist upon this point too strongly, because if you are warned in advance you will not employ a treatment which adds much to the suffering of the patient, and tends to cause the extension of the affection. A proper treatment in these cases saves much suffering, and in most cases I am happy to say it cures the disease speedily. Further, gentlemen, tarry preparations and caustic alkalies are harmful in a marked degree. I shall never forget the suffering of a man who, being in a similar state to this woman, was covered with yards of lint smeared with zinc ointment combined with some preparation of tar. He said he was literally on fire. His sufferings ceased when proper remedies were used, and he made a speedy recovery. This woman illustrates the point well, as she said she had used the ointment which had previously been of benefit to her in the chronic stage, and that her sufferings had been rendered more acute. She speaks of using a small quantity of lard with the same result. What then shall we do, as we have here a great portion of the skin of the body inflamed, and consequently thickened? Our treatment must check this inflammation and allay the symptoms. In such cases, gentlemen, hot or very warm water is often of the greatest benefit. You may order for such cases a bath at a temperature of about 105° Fahr., in which a bag of coarse linen containing about a quart of bran has been immersed and well squeezed out, until

the mucilaginous portions are soaked out. To this bath of about thirty gallons you may add half a pound of borax or sal soda, and in it the patient may remain, keeping the temperature up by the addition of hot water, for fifteen or twenty minutes, or until a slight feeling of weakness comes on. Coming out of this bath, the skin must be dried with great care and delicacy, using a soft towel, and avoiding friction. Then the patient must be covered with soft, unirritating clothing—flannels are very injurious—and the morbid parts to be treated as follows: Over the continuous erythematous patches on the face, neck, and arms you may simply apply lint or soft linen, rinsed out in warm water to which a small quantity of glycerine has been added; and to preserve the warmth you may cover the cloths with a gutta-percha tissue, which for this and other morbid states of the skin is very serviceable, or you may use certain medicated lotions. If you use the warm-water treatment it will be necessary every two or three hours to sponge the parts well with that fluid at as high a temperature as is grateful, and in the intervals apply the lint or linen moistened with it. Besides the warmth, one important and essential point is to keep the parts carefully excluded from the air. I have seen such excellent results from this treatment that I cannot recommend it too strongly, nor impress on you too carefully the necessity of its thorough employment. But in some cases it will soon become evident that it is not exactly the remedy required, and that it fails to relieve after a certain time the sufferings of the patient; indeed, I think that in very few cases can it be considered as the whole treatment. Rather it is beneficial in the very early stages, and prepares the way in an admirable manner for other measures which cure. If then the patient complains that the symptoms are not alleviated, and you see that the affection has not resolved itself, which point you can appreciate by the persistence of the redness and infiltration, and by its possible extension, as well as the sufferings of the patient, which are always an excellent guide for treatment, you

have other equally beneficial measures at your command. There is yet something to be said of this immediate case. You see on this woman's chest small patches of papules, and we are told that the whole trunk is thus covered. These are an important part of the case. Being unfamiliar with the course of this affection, you might naturally fear that by extension of these the whole body would be involved, and I have seen such cases; yet I can confidently assure you that you have a simple and most efficacious application, which will cause these lesions to wither and their symptoms to cease. If, however, you apply fatty preparations here, it is certain you are doing wrong. Then, again, think of the difficulty of properly anointing such a vast space. The remedy which I use most frequently is here in the clinic termed Anderson's powder, as its formula was, I think, first proposed by that accomplished dermatologist, Dr. McCall Anderson; at least he gives the formula and indorses it in his book on eczema. It consists of one ounce of finely pulverized starch, half an ounce of oxide of zinc, and one drachm and a half of carefully sifted powdered camphor. Be watchful that the apothecary makes a perfectly impalpable powder, as I have seen it carelessly compounded, containing gritty particles, which were very irritating to the patient. This powder must be frequently and thickly dusted over the affected skin. It is better, if the patient can afford it, to rub plenty of it into the meshes of fine linen lint, and this should be carefully applied to the skin. This woman says that owing to her obesity she suffers under the breasts and in the groin and gluteal folds, and that there the affection is in patches. These parts must be thoroughly separated by the interpolation of carefully laid lint, permeated with the powder, and the parts themselves must be frequently dusted. In order that benefit shall result, such a patient must be put in bed and lightly but properly covered, having linen or cotton sheets next to the skin. If you cannot obtain lint, the powder may in some spots be applied on thin canton flannel, and

in others copiously dusted, so that the whole body is covered with a thin layer of it. It will enter the meshes of the thin soft underclothes which must be worn in this state. It may appear to you that I am insisting at too great length on these minutiae of treatment, but from extended experience I feel the necessity for saying what I do. You will be gratified at the quickly induced favorable result, as the burning itching will be almost wholly allayed. The action of this powder is manifold: it protects from the air, and the starch and zinc act as astringents, while the camphor gratefully stimulates and allays pruritus. One point is essential, namely, the frequent renewal of it in sufficient quantity as it falls off the parts, and as, owing to its volatile principles, the camphor evaporates readily. Such, then, are the indications for the local treatment; and I have only a few more words to add as to the use of the hot water. If, as I have said, it ceases to be of benefit, you must stop it immediately, and use a treatment such as the next case demands, or you may use the powder over the face and neck in the same manner as you did on the body. About the head you will find some difficulty in keeping the powder in proper apposition, but with a little care you can so nicely fit the pieces of lint that the desired end is attained. This treatment will, as I say, either arrest and cure the disease, as I have often seen it do—as we may say, really choking it—or it may cause it to pass into the subacute stage, and then it demands a radically different treatment, which we will consider later on. I will only add that the simple prescription of these measures of relief is not enough, and you must see to it yourselves that the applications are properly made, else your efforts are futile. You generally can command the services of some one who will constantly attend to the dressings, which must be as constantly watched by you.

Now then as to internal treatment, which in these cases is absolutely needed. The bowels must be moved by an active cathartic, and the old cathartic pill of the Pharmacopœia answers

all purposes. Give three or four at night for an adult, and if they operate sufficiently, do not repeat until the second or third night, and then you may give one less, say two or three. During the day, it is well to give alkalies, such as the citrate or acetate of potassa, in thirty-grain doses every three hours. Or you may give every three or four hours a mixture of rhubarb and soda instead of the potassa and pills, as some writers prefer this combination. To my mind, the one first spoken of is the simplest, best, and least nauseous. Such patients complain of great thirst, which is relieved by draughts of cold Vichy water. One practical point here suggests itself by the bad results witnessed by me in a case not long ago, which is this : never give the iodide of potassium in this condition, for, owing to constitutional idiosyncrasy, this drug causes, in some patients, congestions of the mucous membrane and of the face, and may be the cause of aggravating a very troublesome affection, which it will not under any circumstances benefit. The diet of these patients must be strictly cared for, and in most a light and digestible one is indicated. Bread, milk, delicate broths, notably of chicken, are to be used, and all fluids are to be taken rather cool, as hot drinks for a time much aggravate the affection.

Such are the main points in treatment ; and I am happy to be able to tell you it is usually as efficacious as it is simple and dictated by common sense. I have seen such cases cured in two weeks, they are always much benefited immediately, and the treatment which you adopt will, if not thoroughly successful, render your further efforts easier and more certain. I must yet add one word as to a therapeutic necessity which will arise in extremely nervous and excitable people of all ages, chiefly women, and in the very aged ; for the latter, I am sorry to say, very frequently are afflicted with acute eczema. Sometimes the subjective symptoms of a burning itch are intolerable, particularly at night, and are then not relieved by the local application. In some cases it

simulates a severe neurosis, and the sufferings are excruciating. Of course, humane motives would prompt you to give such a person relief, but the necessity for such is absolutely called for by the fact that, if unrelieved, the patient will scratch with such vigor that the disease will be very greatly aggravated. The best remedy I know of in these cases is a combination of chloral hydrate with bromide of potassium : try at first ten grains of the former and twenty or thirty of the latter in a proper amount of water, to be repeated as necessary. Use this remedy in full dose, but with care. I have been led to think that the bromide is especially adapted to the alleviation of cutaneous irritation. There are several reasons why opiates are not beneficial : the chief one is that they stimulate the cutaneous vessels, an effect of which you want the reverse ; and they seem in some persons to irritate the nerves of the skin. It is well known that this causes pruritus. In very severe cases of itching in this and other affections, you can use a very powerful anti-pruritic made by dissolving powdered camphor in chloral. The mixture is made as follows : a given quantity, say two drachms of chloral hydrate, is rubbed with a few drops of glycerine, and a syrupy liquid results ; to this is added as much powdered camphor as will incorporate itself so as to form a liquid rather more dense than glycerine. This application is worthy of extended use in cutaneous pruritus, and I have also seen decided benefit from it in certain forms of neuralgia. Remember the fact, then, gentlemen, and when such patients complain of this excessive suffering, you must use the necessary means for its alleviation.

The next case you have seen before. Anne E., several years ago, in the way of employment, handled colored leather, and soon her hands became affected. She was treated by me for scaling eczema of the dorsum of both hands and of the fingers. As is so often the case, this chronic eruption has been replaced by two acute attacks, and it is for the last of these that she is now here. Briefly stated, her condition of health may be con-

sidered good. Her nutrition is fair, as she is well nourished, her strength is of the average of females, and her appetite good. She is, however, at times troubled with an acid dyspepsia, an affection with which she has been afflicted for some years, and she says her mother has the same. Let us now look carefully at the disease. In her case also, the head, neck, and arms are involved. The body is spared, but she says she has patches in each popliteal space. You observe that the skin of the face is red, scaly, and about the mouth and under the eyes fissured; near each ear there is an irregular spot from which the epidermal scales are shed and a serous fluid escapes. You find the same thickened skin as in the first case, and the subjective symptoms are similar. But mark the difference in the morbid appearances. In the former case the epidermal layer of the integument was not cast off, and was only proliferated in slight excess, as shown by the trifling amount of scaling. Here we have an equally inflamed skin, in which the epidermal layer in several parts yields, and we have an oozing surface. Let us look still further. Here on the arms the conditions are similar, and at the wrists there are broad fissures which only extend through the upper layers of the skin and lay bare the mucous layer. Just here you find some of these crusts composed of epidermal cells and dried serum. The history of this eruption gives us the same acute invasion within twenty-four hours, with the same systemic reaction as in the other case. This then is an example of acute scaling and moist eczema, and shows well how the forms of the affection run the one into the other. It is, as I have said, a peculiar inflammation of the skin attended with varying objective features, owing in a measure to the peculiarities of the portions of the integument invaded.

Now, then, as to treatment. The same objections already stated to the use of fatty preparations apply in this case. They increase the suffering. You must remember that in this case there is a decided tendency for the casting off of the epidermis, and this point

I must lay stress upon. The indications are to reduce the inflammation and infiltration. You might perhaps be disposed to use hot water in such a case ; but I can tell you from experience that in these cases of eczema rubrum, in which the epidermis is so readily cast off, and in which there are really raw spots, this agent will often very much aggravate the condition, causing a general shedding of the epidermis, and thus making it perhaps a case of universal weeping eczema. It is therefore contra-indicated. This I can assure you is a very important point, for your aim must always be to preserve in such a case the superficial layers of the skin and prevent their destruction. Whereas in the other case this complication was not imminent, you could use hot water with benefit : in this you would produce for yourself a state difficult to treat. I trust I have made this matter plain to you, for as a therapeutic indication I have found it frequently to be of the greatest importance. Let your rule then in these acute cases be, and I repeat it with emphasis, to examine the epidermal layer well, and if you find that it is an instance in which the epidermis is not readily shed, you will generally derive benefit from hot water. But for this variety now before us we have equally as satisfactory measures, and they are of the simplest character. In such a case as this, the ordinary black wash will often either cure or at least relieve the acute stage. I very frequently use it mixed with a small quantity of glycerine, and applied nicely on lint, in smaller patches of acute eczema, and have always been satisfied. Where so large a surface as the present is to be treated, I think that nothing is better than the ordinary lead and opium wash ; always, I must repeat, nicely applied on soft linen lint, which must be frequently moistened. As the burning itch is of so serious a character, I often add spirits of camphor to the lotion as it tends to allay the symptom. As there is much tension of the skin, and as these washes have an astringent effect, I have been led to add glycerine to them, and this agent has proved in my hands a valuable adjuvant in relieving this symptom, which

I can assure you is often troublesome. Even with the warm-water treatment you will find that the addition of about one twentieth part of glycerine is beneficial. The formula I should recommend to you then for this case is as follows :

R. Liq. plumbi subacetat. ʒ ij.
 Tr. opii. ʒ ij.
 Tr. camphoræ. ʒ j.
 Glycerinæ. ʒ ij. M.

Signa : to be mixed with a quart of water, and applied on lint.

I need not repeat what I have said of the necessity for care in applying the dressing. I may add that in the most severe stage of this form of eczema you may often allay the burning pruritus by a few ablutions of hot water. Once or twice a day the parts may be carefully bathed as already directed, and then the lotion should be continuously applied. You will soon learn from the patient whether any benefit follows, and by such information you will guide your measures. I must not forget to tell you that when this affection involves the face there is a liability for the eyelids to become very sore ; a condition which I have seen become chronic from want of care. See to it that the lids are dried carefully twice daily, and their edges moistened with fresh cold cream, particularly at night. Though a seeming small matter, this is of much importance. The same cathartic alkaline treatment of case No. 1 is required by this one, and the same attention to diet. This course of treatment will certainly do much good, for the last similar attack of this young woman was thus cured. I hope this result will now follow ; at least I know that she will be well on the way of cure, and the least successful result will be that in ten days this affection is reduced to a mild subacute stage, which can then be readily cured in a manner which will be spoken of when studying the next case.

Such then are the main points in the treatment of these two

forms of acute eczema ; and I may here, with profit to you, allude to a clinical feature which demands a little different treatment. You will sometimes observe acute eczema of the vesicular and pustular forms. They present a different appearance. Patches of vesicles or pustules develop on thickened red skin, the epidermis is rapidly cast off, and you see then a copious oozing of a sero-purulent fluid which may or may not concrete into crusts. Here you have simply excessive secretion, in addition to the appearances shown by the last case, and to treat it you need a somewhat stronger astringent. You simply add either subnitrate of bismuth or oxide of zinc, finely powdered, to the last given formula of lead, opium, etc. Add of these powders half an ounce to each pint of wash, and then direct that the fluid shall be well shaken before use. This simple addition will be very beneficial, and is distinctly called for by the morbid condition. Such, gentlemen, is, in the main, the treatment of acute eczema ; and I think you will now more thoroughly appreciate what I said in the beginning of the great necessity of studying the morbid indications and of applying to them an appropriate remedy. Let me insist on the absolute necessity of active, energetic treatment early instituted in these cases, because, if this affection is unchecked, it intensifies itself in the parts already invaded, and it then involves other parts. In short, it stamps its impress on the tissues in such a manner as to be difficult of eradication. Let us now study together the case of these children, who present chronic forms of eczema, which call for a different course of treatment. Having presented the therapeutic indications of these cases, I shall have fulfilled my promise to review in a general and practical way the treatment of this affection.

Thos. F., aged ten months, was healthy until he became afflicted with the present eruption. His parents have had no skin disease ; the father has some pulmonary affection, but the mother is healthy. This is their third child. Two months ago the present affection

began as a small spot on the scalp. Not having been treated, it has extended, and now you see the child in a pitiable plight. The whole scalp is affected. You observe large, yellowish green, quite thick, irregular crusts. The main large one is dry and quite firmly adherent to the integument, and besides there are a number of smaller ones of a more decided yellow, softer in consistence, and when removed with care we find a thickened red and oozing surface. Observe that this oozing surface is not deeply ulcerated, but, on the contrary, superficially excoriated. As I have heretofore explained, the parts of the skin above the mucous layer have been cast off. Here, on the forehead and cheeks, we see a large weeping patch, with here and there clusters of vesicopustules. There are similar patches on the trunk, and the hands, and fingers and thighs are likewise involved. Mark the swollen condition of the post-cervical ganglia—a complication not infrequently seen when the integument of the scalp is greatly inflamed. The mother informs us that the child is nursed by her, and was not out of health until about a month after the onset of this affection. Now it nurses irregularly, has acid eructations and foul passages. It is cross and peevish, and at night restless, owing to its suffering.

This then is an example of *eczema pustulosum et rubrum*. We must here allay the inflammation, reduce the infiltration, and restore to the integument a normal epidermal covering. The first necessity is the removal of the crusts, which can be easily accomplished. The scalp hair of this child is so thin and short that we need not cut it, as in some cases it is necessary to do. Then you apply a piece of linen, or, what is always best, lint, thoroughly saturated with sweet oil or glycerine. Over this you place a layer of the gutta-percha tissue, which is so valuable as a thin and easily applied retentive of heat and moisture, the whole to be kept in firm coaptation by a cotton-flannel nightcap. These are not unnecessary refinements in treatment, for you never can

successfully treat a case of eczema until you can apply thoroughly your remedies to the morbid surface. Usually one night will be occupied by this procedure. The oil or glycerine permeates, softens, and loosens the crusts, while the heat retained by the gutta-percha tissue assists in a marked manner in the process. I have used this latter tissue with good results in these cases, and I warmly indorse it here, as I have not seen its use mentioned by others. When softened, these crusts are to be carefully removed, using no force, gently lifting them up with a comb, and clipping all hairs which tend to keep them in place. Having laid bare the eczematous patches, you then can apply your treatment; and there are certain points suggested by the seat of it on the scalp. In general on this site, zinc ointment, which is usually so beneficial, must be used with care; otherwise patients, particularly those who frequent dispensaries and clinics, allow layers of it to form on the surface, which act often as badly as crusts. For this subacute weeping form of eczema you need slight stimulation, an astringent effect, and total exclusion from the air. The really delicate point in treatment is the adaptation of the proper amount of stimulation, as this effect may be very beneficial, or, if it is too violently applied, it may do harm. In this connection I must lay stress on a fact which can only be learned by you practically, and that is, that in children particularly, you must always stimulate morbid cutaneous processes with great care. Their tissues are so soft and delicate, and react so violently to irritation, that much harm can be done them if care is not exercised. You will very rarely be called upon to use on the skins of children strong solutions of potash or similar preparations of tar. Even in psoriasis in these subjects, where considerable stimulation is required, you cannot be too watchful. Another point of importance in the treatment of such a condition as the present, is the necessity for the occasional application, say twice or thrice daily, of the remedy you prescribe, by friction with the tips of the fingers. It is not sufficient to

simply place layers of ointment and lint on the parts, but they should be really anointed. Taking a small quantity of the ointment, with care and gentleness it should be rubbed over the entire spot. Usually this action is well liked, as it relieves itching and really replaces scratching. I think that much of the good thus produced is due to the mechanical gentle massage, as we may term it, of the cells, nerves, and vessels of the parts. In large spots it may be necessary to employ little pads made of some soft fabric. After this you are to apply your remedy, and use such measures as will keep it in close, firm coaptation. A canton-flannel cap made of the shape of the skull is very excellent. The formula best adapted for this form of eczema is as follows :

R.	Zinci oxidi.....	3 ss.	
	Hydrarg. ammoniati.....	gr. vj.	
	Pulv. camphoræ.....	3 j.	
	Ung. simplicis.....	3 j.	M.

You may modify this prescription very materially, and sometimes a change of dressing is beneficial. You may substitute subnitrate of bismuth for the oxide of zinc, red for the white precipitate ; or you may cautiously add a few drops of the tarry oils. You cannot be too careful in seeing that your simple ointment is fresh, and not too stiff ; for rancid fats are highly irritating, and ointments of very firm consistence present difficulties in being readily rubbed in, and cannot be spread in a smooth layer. I have lately used in some cases with much benefit the vaseline of the stores. It is excellent when used only for rubbing in, but, owing to its quality of readily melting at slight heat, it does not answer well as a continuous application. I would suggest that a small quantity of wax be incorporated with it, and should then expect a valuable adjuvant to cutaneous therapeutics. You can always render your ointments soft and pliable by the addition of about two drachms of glycerine to an ounce of ointment. Always,

then, when you use an ointment continuously, see to it that it is of the proper consistence. The second formula, which I think excellent in these cases, is as follows :

R. Bismuthi subnitrat..... ʒ j.
Hyd. oxid. rub. pulv.... gr. vi. ad gr. x.
vel Hyd. submur..... gr. x.
Pulv. camphoræ..... ʒ ss. to ʒ j.
Ung. simpl. (mollis).... ʒ j. M.

You will find some difficulty, especially in children, in applying your remedies to the cheeks, and you will often have to content yourself with the frequent frictions I have spoken of. The neck offers less difficulty, and patches about the trunk and thighs need your careful supervision. In this connection remember that urine and saturated diapers are very irritating to the skin, and cause an extension of the disease. You will often have, as a premonitory sign of coming trouble in such cases, an erythematous condition of the genital and anal parts. Take early active measures ; see that the parts be carefully dried and thus kept, and order them to be frequently dusted with the powder spoken of a few minutes ago, or with the ordinary infants' powder. I have been led to think that the addition of a small quantity of one of the mercurial salts spoken of, in an ointment, is very excellent in eczema of the head ; more so than elsewhere on the body, so that I rarely use them except on the head. For this case I should advise, for all the other parts, benzoated zinc ointment, one ounce, camphor, half a drachm, with perhaps half a drachm of the oil of cade or the oil of birch. When in these cases you use the tar preparations thus early, watch their effect well, and if you see they do good, continue them. If they, however, are irritating, leave them out, and use simply the ointment with camphor for a few days, and then you certainly can incorporate them with benefit. In very raw subacute cases, attended with much itching, you can always

use camphor without harm ; but not so, as a rule, the tarry preparations. Having used for a few days the ointment just spoken of, you may add to it either the oil of cade or oil of birch. Begin with half a drachm to the ounce, and increase until you reach a drachm, and even one drachm and a half.

If this treatment is sedulously followed, it is certain that amelioration or a cure will result ; but only is this end attained when the remedies are used as they should be. You will observe that the redness becomes less, the thickened skin more supple and more easily pinched up, and that a tolerably healthy epidermis has replaced the former raw surface. As signs of an imperfect cure, you will sometimes see small disseminated red spots, chiefly of follicular origin, or that the integument is still not perfectly supple. These are important clinical indications which show the necessity of a continuance of the treatment. As the epidermis becomes replaced, if the thickening persists, you may be sure that greater stimulation is needed, in which case you increase the tar as I have directed, taking care not to be too active in your measures. Let us not forget the swollen state of the glands of the neck : never allow them to be poulticed, as by so doing you run the risk of producing a new spot of eczema or of irritating an old one. When the lesion of the scalp and of the skin of the neck is cured, this adenitis, if suppuration has not yet commenced, usually will cease, and will subside in proportion as it becomes less severe. In rare cases they undergo suppuration, but then it is well to be very careful of the dressing used.

Poultices are never to be used on the scalp to remove the crusts, as you can rarely succeed in having them well applied, and they usually do harm. Sometimes in these cases, indeed very frequently, you see small, or even large isolated and widely scattered spots of papules or of erythema appear in various places, particularly where two cutaneous surfaces come in contact. These spots, if uncared for, will almost inevitably become larger and more formi-

dable; hence they need very early and active treatment. You can *always abort* them, if you keep them well dusted with Anderson's powder, and carefully covered with pieces of lint. You will see the redness become pale, slight desquamation to occur, and that soon the parts are in a normal state. This same complication will frequently be observed in older persons, and requires the same measures, and is attended in most cases with a like good result.

Such, then, are the indications for the local treatment: let us now consider the internal treatment. Before directing any internal medicinal agent for any case of skin disease, be careful always to determine as far as possible the state of the health of the patient. Just as we see local treatment injudiciously ordered for these cases of infantile eczema, so also do we find excellent therapeutic agents wrongly employed internally. There is a popular notion that these children require cod-liver oil, and preparations of iron and arsenic, and we see frequently here at the clinic instances in which these remedies have been given to children not needing them. I shall then try to complete my history of infantile eczema by considering in a practical manner this very important question. I am led to do so all the more as I cannot direct you to any published communication which clearly discusses this matter. I shall tell you when to use these remedies with marked effect, and, what is equally as important, when to leave them alone. The therapeutical considerations suggested by this case will constitute an excellent groundwork for our study.

The true facts of this child's medical history are these: Born healthy, and so remaining until some time after the development of this eczema, it passed through the febricula incident to vaccination in a normal manner. When eight months old, a red spot appeared near the vertex, and this rapidly extended, until now, having existed two months, it is as you see. When the affection began, the mother says the child was perfectly

healthy, but within a few weeks it began to be peevish and to pine away. Its appetite has become impaired, and the acid eructations have been noticed, together with the intestinal difficulties indicated by the foul passages. You see now that its nutrition is much impaired, and the child has a restless, sickly look. Much of this is due, according to the mother, to the loss of rest occasioned by the severe itching. The ganglia have only become swollen within two weeks ; and this point is important, as I shall show you. You can readily see that an imperfect investigation of this case would have led you into the error that the cutaneous lesion was the outcome or expression of the general state of malnutrition ; but such a view cannot be held, as the intelligent statements of the mother prove beyond a doubt that the cutaneous affection came first by a well-recognized period. Eczematous children will come to you in a debilitated state, and it will be found upon investigation that the extensive cutaneous lesion has been the cause of the child's ill health. In many such cases the suffering incident to it plays, I suspect, a very prominent part. This is a point which I have never yet seen properly developed ; and I think that when your attention is called to it, you will find many similar cases. It would be easy to class this child as scrofulous, and its eczema as due to that condition : such is, I fear, frequently done ; and I know that a prominent dermatologist mentions the cervical adenitis, the origin of which we have simply explained as being merely an accident, as one of the manifestations of struma. Always then, gentlemen, institute a thorough non-partisan inquiry into the antecedent state of the health of the child. As we have no evidence of any dyscrasia in the parents or in the child, we are led to think, and I believe correctly, that the eczema, which at first was of limited extent and mild in character, became in consequence of irritation aggravated ; it increased greatly in extent owing largely to the delicate structure of its skin. It can readily be understood that an eruption of such extent and severity as the

present can cause grave systemic reaction, which results in impairment of the functions and a general condition of debility. This simple and warrantable explanation suggests to us readily the appropriate treatment. Our first duty then, after attending to the local cause, is to correct the condition of the gastro-intestinal apparatus, for it is an indication of first importance that the nutritive functions of this child should be properly performed. Some observers think that this condition, namely, disturbance of the alimentary canal, will really cause eczema in children; and I am at least certain that its long-continued existence will aggravate and perpetuate that disease. We know that owing to reflex action from the digestive tract, erythematous and urticarial symptoms are produced at times, though generally quite suddenly; so also do I think that the same condition in a chronic stage may by its reflex action complicate eczema in children for the worse. I have frequently noticed this fact, and it has taught me the great necessity for care as to the diet and regimen of the child. I must here allude to the extended clinical studies in this direction made by Professor W. H. Draper, to whose teachings in this branch you cannot pay too close attention, as you will obtain information and knowledge of great benefit to you in your practice. Time will not permit me to go into the question of diet, but I will say in general terms that in these cases you must prevent the use of too much starchy food in children. Mothers are only too apt to feed their offspring on corn-starch, rice, potatoes, etc., in undue quantities, and the result is chronic gastric irritation and impaired nutrition. See to it then that a food suitable to the age of the child is given, namely, milk in its purest obtainable form, or in its place meat broths well made, with a small amount of bread. Milk is always the best diet, and that of the mother the best of all. Without pursuing this subject then, further than to give you the general principles, which I assure you are very important, I will proceed to the description of the medicinal treatment. In all cases like the

present, you should first act upon the portal and intestinal systems, and your remedies are as follows :

R. Hyd. submur..... gr. xij.
 Pulv. rhei..... gr. xvij.
 Magnes. calcin..... 3 ss.
 M. ft. chart. no. vi.

One powder mixed with water every night. Care must be taken that the purgation induced is not too severe ; therefore, in giving these powders, their action is to be watched. Generally they are needed until the stools are in every way natural. Then, during the day, the following should be given :

R. Bismuth subnit..... }
 Sodæ bicarb..... } ññ gr. xxx.
 Sacch. albi..... 3 j.
 M. ft. chart. no. x.

One powder mixed with a teaspoonful of water three times a day.

Should there be much gastric irritability, two teaspoonfuls of lime-water may be given, mixed with as much water, after each nursing or feeding ; or a little carbonate of soda or Vichy water may be used. Under this treatment the digestion of the child will be perceptibly improved. You may then administer cod-liver oil and preparations of iron, which will then improve the general nutrition. Never give either of these remedies, however, until you have prepared the primæ viæ in the manner indicated, as in disturbed conditions of the alimentary canal they are not assimilated, do harm, and not good. Of course, local inflammations become less severe as you improve the general nutrition ; hence you must in bad cases use cod-liver oil persistently, particularly in cases, gentlemen, in which the eczema is attended with much sero-purulent exudation ; and in proportion as this is copious, so

must you use the oil vigorously ; and in these cases you can always derive benefit from a simultaneous use of quinine. In cases then of ordinary severity, you would begin with a small teaspoonful of cod-liver oil thrice daily, and increase it as you see fit, giving with it a preparation of iron. For these young children, whose stomachs are delicate, to whom you should administer all medicines sparingly, I think that the ammonio-citrate of iron is by far the best remedy. It is readily assimilated, does not disagree with the stomach, nor undergo decomposition. I think it is far preferable to any other preparation, not excepting the syrup of the iodide of iron, a remedy very unstable in its composition, often irritating to the stomach, and always having a very decided metallic taste. Here, in the clinic, we have for years used with satisfactory results the following iron tonic in these cases :

R. Ferri ammonio-citrat..... gr. xlvijj.
 Syr. aurant..... } aa ʒ j.
 Aquæ..... } M.

One teaspoonful three times daily, in a little water. Should you see the necessity to give quinine also, you can use the following, which we have also used :

R. Ferri et quiniæ citrat..... gr. xlvijj.
 Syr. aurant..... } aa ʒ j.
 Aquæ..... } M.

One teaspoonful three times a day in a little water.

I have purposely said nothing of the use of arsenic thus far, as I think that its function in these cases is very limited. I think I am not far from the truth when I affirm that very few cases of infantile eczema really need it ; and I shall, in this connection, in a brief and practical way, tell you when to use it. You undoubtedly know that the physiological effect of arsenic is to stimulate the

cutaneous capillaries, and that it affects also, to a less extent, those of certain of the mucous membranes. It is claimed also that it acts as a tonic, but I think that very few rely much upon it solely for that effect. As we know by experiment, and also by clinical observation, that the smaller bloodvessels of the skin are stimulated by this remedy, and that this is really its only effect, the inference is plain that it is adapted to those cases in which, owing to long-continued inflammation, such as is seen in eczema, the bloodvessels have lost their power of contractility or resiliency. Of course, such a remedy is harmful in acute inflammations of the skin, for which it should never be given. Such then being the action of arsenic, I have been led to use it only in chronic cases, as an adjuvant to the treatment, with a view simply to its local action which I have specified. In any case then, either in child or adult, in which there is chronic inflammation of the skin, particularly in eczema of a scaling form and psoriasis, you may use it, hoping to gain its physiological effects. In children, whose eczemas are often persistent, it is in many cases very beneficial, and should be borne in mind as an adjuvant to your treatment rather than as a specific. It is claimed that it is a specific for psoriasis; but, without wishing to detract from its value, I think that its action is merely subsidiary rather than broadly specific. I am careful to dwell at some length on this point, as there is really so much uncertainty in the medical mind as to the action of arsenic in skin diseases, notably eczema.

Applying then these facts as to this remedy to this case, I should be inclined to use it, when the system is prepared for it. This affection has existed now two months, and it is only by judicious and active treatment that you can cure it. To the mixture of ammonio-citrate of iron just mentioned, I should advise the addition of thirty-two drops of Fowler's solution. This makes the dose two drops of this fluid thrice daily. You must watch its effect carefully, and if it does not disagree, you

may give, during the second week, three drops, and increase thus one drop weekly until you reach six, and at the very most eight drops. As a general rule, children bear arsenic very well, and you will rarely do other than good if you commence with two drops in a child about one year old. But if you observe gastric intolerance, which is usually the first contra-indicating symptom, it is well to cease its use, and to rely upon external treatment, principally aided by such agents as I have told you improve the nutrition. In giving the iron and arsenical mixture, it is well to combine it with about four times its volume of water, and to order it to be taken shortly after food, as at that time it is more easily assimilated. Remember then, gentlemen, that you must not rely implicitly or too exclusively upon arsenic, particularly in these cases. Its action is really limited, and I think I may say it will rarely of itself, alone and unaided, cure a case of infantile eczema. When you use it, do so intelligently, and never to the exclusion of an appropriate and vigorous local treatment.

Summed up, then, the internal treatment of infantile eczema is very simple indeed: induce healthy assimilation, and use iron, cod-liver oil, and arsenic judiciously. I shall say but a few words on the next case, and those will be chiefly as to local treatment.

This child is two years old. You observe that it has a scaling red skin of the forehead, cheeks, hands, and arms. You observe that there is much thickening, particularly about the forearms, where there is a small oozing spot. This child has been here before, having had this eczema several months. This is a case of eczema squamosum. We have here inflammation, with its consequent infiltration and imperfect formation of the epidermal layer of the skin, shown by the reddish glaziness of that membrane and its scaling. In such a case as this, whether in child or adult, some stimulation is always necessary,

and besides that there is need of constant protection until all inflammation has ceased. Mark, gentlemen, we have not here large patches of weeping surface; and though the inflammation is of the same kind as in the case of the other child, it is accompanied with different changes, as seen by the eye. In every case of eczema, then, in which you find thickening of the skin and the epidermis not thrown off, you may take it for granted that you must stimulate. I shall not here repeat what I have already said as to the care to be used in this treatment, particularly in children, but I shall briefly give you the necessary formulæ. For these patches I shall order a prescription first proposed, I think, by Dr. Draper, and used with marked success for nine years to my knowledge in this clinic. It is as follows:

R. Ung. zinci oxidi ʒ j.
 Ol. cadini. ʒ j. M.

This must be rubbed well into all of the patches three times daily, and then they must be covered with layers of lint on which it is thickly and evenly spread. Not only is this formula of benefit in cases like the present, but also in some cases of subacute weeping eczema in which there is much thickening. It often happens, however, that the simulation to be obtained from this ointment is not sufficient. It is very probable that these chronic indurated patches at the back of this child's hands might need some remedy more active. For this purpose you can always use with good results the compound tincture of green soap, or, as it is also called, the *tinctura saponis cum pice* of Hebra, who originally proposed the formula, which is as follows:

R. Saponis viridis..... }
 Ol. cadini..... } āā ʒ j.
 Spt. vini rect..... }
 Ol. lavand. Eng..... ʒ j. ss. M.

This is a most admirable stimulant application for thickened eczematous patches. It should be well but gently rubbed into the spots by means of a small brush, twice or three times daily, for about ten minutes ; after that they should be covered with the ointment just mentioned, or even the simple zinc ointment. Not only does this application reduce chronic swelling, but also it relieves itching very much, so that in children and adults I am accustomed to order a friction by it at night just before retiring, as soon after getting under the bedclothes patients are very frequently seized with a paroxysm of itching. In adults you will find certain old indurated eczemas, for which this remedy is inappropriate, as being too mild, in which case you use solutions of potash of various strengths or the tarry oils alone ; but in children I think it will always be sufficiently powerful, and will, if well used, always be productive of benefit. Remember, however, its application is not continuous ; it is simply occasional and for a specific purpose. In this connection it is well to tell you that there is also a simple tincture of green soap containing no tar, which is excellent also as a stimulant used in the manner directed for the last. I generally use it made as follows :

R.	Saponis viridis.....	}	āā ʒ j.
	Aquæ Coloniensis.....		
	* Alcohol. 95 per cent.....	ʒ ij.	M.

I have generally used this on superficial limited scaling spots, such as you see in children and adults, following eczema.

One final point, gentlemen, only remains as to the treatment of this case. You observe that both of the cheeks of this child are the seat of scaly eczema, and there are evidences upon them of severe scratching. You will find much difficulty in applying any remedy to these parts in children. Therefore I have tried in various cases to adopt one which could not be rubbed off. I have finally hit upon a combination of flexible collodion with oil of cade

or oil of birch, one ounce of the former to half or one drachm of the latter. This may be painted on twice daily. Or, again, I have had excellent effects from using a coating made of :

R. Ether. sulph..... ʒ j.
Ol. rusci..... 3 j. M.

This is to be painted on with a small brush twice a day ; and to relieve the tension which it sometimes produces, I order the parts thus painted to be rubbed with simple ointment, cold cream, or glycerine. The latter procedure I have found very necessary ; and I can confidently recommend this mode of treatment of these parts as being more satisfactory than any other. You will find that the oil of birch will act in some cases better than any other preparation of tar ; therefore I would ask you to keep it in mind.

Such, gentlemen, are the therapeutic points suggested by these very interesting cases ; and I thank you for the close attention which you have paid to me while laying them before you.

PERIPHERAL PARALYSIS,

BY

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You see before you, gentlemen, two cases of paralysis, one of the face, the other of the muscles supplied by the anterior tibial nerve of the right leg. The face is paralyzed on both sides completely, leaving an expressionless blank on the countenance, unchanged by mirth, sorrow, anger; a mask that Talleyrand might have envied. In the other patient the foot hangs flaccid when raised from the floor, the great toe inclined inward from the unopposed action of the posterior tibial muscle. In neither of our patients can any exertion of the will impress the slightest motion on the muscles paralyzed.

Now, as loss of motor power in any part of the body is a symptom common to lesions of very different gravity, and which involve a very different prognosis, it behooves us always to look with great care to the fundamental cause of it, when it comes under our observation and treatment. You must remember that, beginning at the point where the volitional impulse (whatever that may be) affects the material substratum, we may have muscles paralyzed by brain lesions, and, again, these lesions variously affect the prognosis

* This Clinical Lecture was delivered in the University of Maryland, in the winter of 1876.

according to their quality and location. We may have paralysis from lesions of the spinal cord, either its white or gray matter, or the conducting power of the nerves may be interfered with, either within the spinal canal, or at some point from their exit to their termination in the muscular tissue. Muscles may be paralyzed by the introduction into the system of toxic substances. And, finally, the influence of an irritation of one part of the nervous system may so influence another as to keep in abeyance or "inhibit" its activity, causing paralysis of muscles—the somewhat obscure cases of "reflex paralysis." It is obvious that our prognosis and treatment will vary in most of these supposed conditions, and I wish to call your attention to some of the means we have of distinguishing between them.

First, look at this man with the partially paralyzed leg. You see that the loss of voluntary motion is confined strictly to the group of muscles on the anterior part of the leg and foot, the *tibialis anticus*, long extensor of the toes, and *peroneus tertius*, extensor of the great toe, and short extensor of the toes—a group supplied by one nerve, the *tibialis anticus*. Let us, for the sake of instruction, seek the point of lesion without going into the history of the case. As to its being in the brain, there are no accompanying cerebral symptoms, and although such a circumscribed paralysis from brain trouble is supposable, it must certainly be among the most rare occurrences. Again, you see that the muscles are decidedly atrophied. Now, such trophic changes in muscles paralyzed from brain disease are so very rare that, taken with the sharply defined localization of the paralysis, we may cease to look to the brain as the cause of the trouble. Next, the spinal cord, when diseased, from its small transverse diameter, almost always affects both sides of the body, though it may be in a very different degree. But if you suppose a lesion so circumscribed as only to destroy so much of the motor tract as leads to one group of muscles, I now show you a symptom fatal to such an assumption.

I tickle the sole of the foot, the patient's countenance sufficiently shows that he feels it in the usual way, the sound muscles are thrown into involuntary action, the paralyzed do not move, reflex action is lost in them. Now, a lesion of the motor tract alone would leave the reflex activity undiminished, a fact you cannot but be well acquainted with. There is, indeed, one affection of the spinal cord in which such a circumscribed paralysis as that before us is frequently observed, namely, "infantile paralysis," and the kindred (probably identical) affection in the adult, "anterior spinal paralysis." In this last-named disease, we would have most of the symptoms presented in our patient—circumscribed paralysis, atrophy of muscles, and loss of reflex contractions. In "anterior spinal paralysis," however, it is supposed, with, I think, every show of correctness, that the fundamental lesion is an atrophy of the large stellate cells in the anterior horn of gray matter, with which the motor roots are in direct connection, thus interrupting the transmission of the will, and breaking the reflex arc between the sensitive, or centripetal, and the motor, or centrifugal fibres, but leaving the sensitive tract unimplicated; there is no anæsthesia. Now, on applying the faradic current with dry electrodes to the legs of our patient, we observe at once that there is considerable loss of sensation in the affected leg, over the paralyzed muscles.

In a recent paper of great interest, Remak* has called attention to the paralysis of muscles of the lower extremity in lead poisoning, in which, as in the arms, a group of muscles in the legs seem by preference to be affected, and in these cases we have the loss of reflex movements, but the sensibility is intact. Moreover, the group of muscles affected are the peronei and extensor of the toes, the tibialis anticus notably remaining unaffected.

I think we may thus by exclusion pretty fairly come to the conclusion that we have here to deal with some affection of the nerve

* Archiv f. Psychiatrie u. Nervenkrank. vi. 1 Heft p. 1.

trunk above the paralyzed muscles, which interrupts the impulse of the will—a peripheral paralysis.

The history of the case is simple enough, and leaves no doubt of a nerve injury from a fall, in which the leg, just below the head of the fibula, was struck violently against some hard object. He had probably afterwards some neuritis, as he suffered very much with pain in the leg and foot along the course of the cutaneous branches of the external popliteal. In this case, then, the diagnosis is easily enough made without the aid of our previous investigation; but you must remember that it is not always so, and that cases may occur of multiple injury where it is of great moment, and not easy to decide how much is dependent on central, how much on peripheral injury.

Let us now consider our patient with the paralysis of the face. Some have made a special affection of facial paralysis occurring on both sides of the face simultaneously, under the name of *diplegia facialis*; but there is nothing conclusive as to its nature from its being double. We have here, with the paralyzed condition of the muscles, the sensibility of the face perfect. That we have loss of reflex action in the muscles is obvious, as you see that touching the conjunctivæ does not cause winking, nor tickling the nostrils any movements of the face.

We may easily distinguish a peripheral paralysis of the face from a cerebral one caused by lesion of the hemispheres, or their motor ganglia, from the fact that all the branches of the facial are involved in the former, while in the latter the nerve twigs supplying the orbicular muscle of the eye and the corrugator of the brow escape. Thus, as you see here, the patient cannot close the eyes, which remain open even in sleep; while in the case of the man with hemiplegia, seen by you on a former occasion, although the lower portion of the face was decidedly paralyzed, he had no difficulty in shutting the eye of the affected side, even forcibly, and frowning. I should tell you, however, in passing, that these

muscles about the eye do not absolutely escape in all cases of hemiplegia ; but at most they are weakened, not paralyzed. I cannot give you any anatomical facts explanatory of this immunity in cerebral lesion.

There is a form of disease with which the case before you might at first, to an inexperienced eye, be confounded. I mean the affection of the pons and medulla, in which the nuclei of the nerves of those regions are implicated, as a consequence of which there is progressive loss of power of motion in the lips, tongue, and muscles of deglutition.

But, apart from the fact that the paralysis is principally in the lower part of the face in that disease, you see that our patient moves his tongue with normal facility, and swallows with no unusual difficulty when his nostrils are closed with the thumb and finger, which would not be the case in glosso-labial paralysis.

There are cases, however, in which a disease of the nucleus of the facial nerve causes a paralysis of all the branches of the nerve, and destroys the reflex action. And here we cannot argue from the unimpaired sensation one way or the other, as we did in the preceding case, when we were dealing with mixed nerves, embracing motor and sensitive fibres, because, as you know, the face is supplied with sensation by the fifth, which runs its course quite apart from the facial until we come to its terminal twigs, and so may readily escape an injury involving the trunk of that nerve.

But while a lesion circumscribed within such narrow bounds as to affect the facial alone, it must be considered as amongst the rarities, the nuclei of the nerves in the pons and medulla lying so close together that, with a diseased condition of one, others are almost always affected.*

The history of this case, however, clearly points to a peripheral

* Benedict gives, as a pathognomonic symptom of paralysis from disease of the nucleus of the facial nerve, a crossed reflex action on electrifying the fifth nerve.

origin of the paralysis. The patient was exposed to very cold and inclement weather, and suddenly was made aware that something was wrong by the insufficient action of the lips on one side in drinking. Being unable to forego his occupation in the open air, he continued exposed, and, a day or so afterwards, discovered that the other side of his face was also affected. In short, he has a double rheumatic facial paralysis. The facial nerve is peculiarly liable to this accident from its exposed situation, and its long course in the bony canal through the petrous portion of the temporal bone. Here, a neuritis, with exudation in the nerve-sheath, may cause such a compression of the nerve fibres, from the unyielding nature of the walls of the canal, as to set up those degenerative changes which I have already described.

There are so many interesting points, in regard to this particular form of peripheral paralysis, that they will require another occasion for me to bring them before you as they deserve, and I use this interesting case at present only for the purpose of fixing your attention on the general features of a peripheral paralysis which it presents.

I will next call your attention to the use we may make of electricity, in assisting our diagnosis in cases of peripheral paralysis.

Turning to our first patient, I begin by applying to the muscles of the sound leg, corresponding to the paralyzed muscles, a faradic or induced current of electricity sufficiently strong to produce vigorous contractions (and it is always well to compare the sound side with the affected one, in case of individual peculiarities). The same current applied to our paralyzed muscles is absolutely without effect. If I apply the electrodes over the course of the external popliteal nerves, first of the sound, then of the affected side, I find the same difference: contractions on the sound side; complete absence of them in the paralyzed muscles. Thus, in this case, we have, with the loss of voluntary power, also the complete loss of faradic excitability in both muscles and nerve. The other patient presents us the same want of excitability by the in-

duced current in both facial nerves and all the muscles of the face. Turn your attention for a moment to another patient, whom you see standing here, with a partially paralyzed face, and on the same side a completely paralyzed arm and hand, a condition that has now existed for a long time. You see that an induced current, of even moderate strength, causes contractions of these paralyzed muscles, which are quite as strong as the same current elicits on the sound side. This last patient is hemiplegic; his paralysis the result of brain lesion. You remember the man in the ward suffering with a myelitis? I showed you that though his lower limbs were absolutely paralyzed, the induced current caused the muscles to which it was applied to contract, though feebly.

Thus, in peripheral paralysis, the nerves and muscles implicated, after a short time, cease to respond to excitation from the induced current, and so we have one means of distinguishing them from the paralysis of central origin. I say after a short time, for, within the first five days, the faradic contractility remains unaltered, or may even be more than natural.

This peculiarity of loss of faradic contractility is, however, found also in "infantile paralysis," "anterior spinal paralysis," and paralysis from lead poisoning.*

Let us now try the effect of the galvanic, or, as it is commonly called, the "constant current." You have learned, in a former lecture, that, upon closing the circuit of a sufficiently strong current, by applying the cathode or negative pole over a healthy nerve, a contraction follows in the muscles supplied by the nerve. A contraction also occurs in a muscle to which the cathode is directly applied. Or we say, indirect or direct application of the cathode causes contraction. If we increase the strength of the current, we have not only contraction upon the application of the cathode, but also, in a less degree, upon applying the positive

* It is still disputed if, in lead poisoning, the paralysis is central or peripheric.

pole or anode; and further, upon breaking the current, by removing the anode from contact with the part. Now, in this paralyzed leg, we find that if—the positive pole being placed on an indifferent spot, as the patella—we close the circuit, by placing the negative pole over the external popliteal nerve—the nerve which supplies the paralyzed muscles—no effect is produced, no contraction follows. The same result is obtained if we reverse the poles, or if we increase the current ever so much. The muscles cannot be excited to contraction by the galvanic current applied to their motor nerve; the nerve has lost its galvanic excitability.

But now let us apply the galvanism to the paralyzed muscles themselves, and you see a remarkable result. The application of the cathode causes a distinct contraction of the paralyzed and atrophied muscles, and that too, observe, with a current the strength of which we have diminished until it is too weak to cause contraction in the corresponding healthy muscles of the other leg. And more: if I reverse the position of the poles, so that the anode is placed upon the paralyzed muscles, a stronger contraction takes place at the moment of closing the circuit than was produced by the cathode, and also a strong contraction follows upon breaking the circuit by lifting away the anode. The paralyzed muscles show an increased excitability to the galvanic current over healthy muscles, and the laws of galvanic contraction are changed for them.

Let me call your attention to the manner in which these muscles contract. In healthy muscles the contraction caused by closing or breaking the galvanic current is short and sharp; a flash of contraction, so to speak. In these paralyzed muscles you remark that it is slow, sluggish, as it were, deliberate. A certain length of time is required for the galvanic current to affect them, for if we apply it rapidly, interrupted as the faradic current is interrupted, it will not produce the effects you have witnessed. I cannot now go into the proposed explanation of these remarkable phenomena, nor

indeed the variations they may present in different cases; but only tell you the conditions under which they occur. These conditions are, injury to the trophic fibres or fibres presiding over nutrition going to the muscle, and a consequent atrophy of the muscular substance, with proliferation in the interstitial connective tissue. Hence we have these peculiar contractions termed degenerative reaction ("entartungsreaction"). You must remember that they are not observed immediately after the paralysis is declared, but only after such time has elapsed as is necessary for the degeneration in the muscles to reach a certain degree—about the second week.

As the trophic fibres are very rarely affected in brain or spinal cord paralysis, we have in this "degenerative reaction" a most valuable means of diagnosis for those of peripheral origin, even where the affection of the nerve fibres is situated within the spinal canal, as, for instance, in the cauda equina. The degenerative reaction is seen also in infantile, or anterior spinal paralysis, and paralysis from lead poisoning, and here we must depend on the accompanying symptoms and the history of the case to discriminate between them and the class of cases before you.

Let us now briefly recapitulate the distinguishing marks of a paralysis from interference with the conducting function of the nerve trunks—peripheral paralysis. These trophic changes showing themselves in atrophy of the muscles, reflex excitability is abolished, as also associated movements, which sometimes take place in paralyzed muscles, as, for instance, the raising of the paralyzed arm of a hemiplegic in yawning, etc., loss of the faradic excitability in the nerves and muscles—this is not, however, absolute except in severe cases; in lighter cases of peripheral paralysis it may be retained, and indicates recovery more or less rapid—loss of galvanic excitability in nerves, with increased galvanic excitability in muscles, the contractions produced being of a peculiar slow character, and occurring under altered galvanic laws.

Anæsthesia of the skin, though of great significance when present, is not always an accompaniment. If we have to deal with a pure motor nerve, as the facial, it will of course be absent; but even in injury of mixed nerves it may pass off long before the paralysis of the muscles has improved. It is very difficult to explain how it is that in mixed nerves we may have the fibres which conduct motor impulses totally deprived of their function by a lesion; while those for conveying sensation, though intimately mingled with them, escape, or more or less rapidly recover their functional integrity. Have they a greater power of regeneration, or is a less perfect organization required for conveying sensation than for transmitting a motor impulse? or do we in our observations content ourselves with the fact that the patient can "feel," and overlook degrees and abnormalities of sensation?

Let us now consider for a moment the changes which have probably taken place in the nerves and muscles of our patients, before we consider what we shall do for them, and what are their prospects of recovery.

From many observations made on nerve injuries in men, from many experiments on animals, though unfortunately far from leading to a unanimity of conclusions, we suppose that when a nerve is damaged to such a degree as to cause a paralysis of the muscles it supplies, whether it be a blow, or a compression from without the body (for example, the pressure of a crutch in the axilla), or the pressure of a tumor, or exostosis, or an inflammation and thickening of the neurilemma, or the direct solution of its continuity by a wound, then follows a destruction of its fibres more or less complete, which advances far beyond the point injured.

First, the white substance of Schwann becomes affected, coagulates, breaks up into globules, and is reduced at length to a fatty emulsion. The axis cylinders resist longer, and, in the lighter cases, where the nerve does not entirely lose its electric excitability,

and recovery is rapid, it is probable that they do not degenerate completely. In the more severe cases they also are destroyed, so that the primitive sheath of the fibre contains a homogeneous mass, the remains of the white substance of Schwann, and the axis cylinder. With these changes in the nerve elements, which advance from the injured point toward the periphery, there is a hyperplasia in the neurilemma, a proliferation of its cellular elements, causing a general thickening of the nerve sheaths, to the later contraction of which is probably due some of the after-effects of these injuries, as spasm, etc. The degeneration of the muscles has already been mentioned, and consists of a general atrophy of the fibres, with apparently a chemical change in the contractile substance, and an increase of the interstitial connective tissue.

We must remember then, that in severe cases, as of our patient, there is a real solution of continuity in the tracts for conducting the impulses of the will, and the impulses from the gray matter of the spinal cord, and that, even in lighter cases, we have to deal with comparatively gross material changes, not so-called functional derangements. Recovery will consist in such change of tissue in nerve and muscle as will restore them more or less to their healthy state.

I think you will agree with me that in some cases of peripheral paralysis, time is an essential factor in the recovery, even with the best treatment begun at the earliest time. Indeed, there are few cases coming under the care of the physician when the patience of all concerned is so sorely tried, and it is important in the outset of our treatment to set this forth fully, else the means of recovery may be abandoned in despair long before a reasonable hope should vanish.

As many cases of peripheral paralysis—for example, of the facial caused by cold, of the radial from pressure exercised on it for a short time, etc.—recover spontaneously, the opinion is sometimes expressed that they call for no treatment of a special character,

and, in fact, cases of this kind are very commonly abandoned to themselves, with the assurance that time will effect a cure. Now, we have cases of all grades of severity, from those lighter ones to those enduring paralyses which resist all efforts for their cure. And I feel quite certain that the use of proper therapeutic means will not only hasten the recovery of the milder cases (though this is denied by one high authority), but will succeed in rescuing a fair proportion of cases from the class of hopeless ones.

And in the first place we must remove the cause, when it can be reached ; as when the paralysis is caused by pressure on a nerve by a tumor, an abscess, an exostosis, etc. Thus an exostosis may produce a paralysis which quickly disappears under an anti-syphilitic treatment. Acute neuritis, if present, must be combated by local blood-letting, cold, counter-irritation, etc.

The most common remedy resorted to by the laity, and, indeed, I think too often unreasonably confided in by professional men, is friction with liniments of some stimulating substance, and as a certain, or rather uncertain amount of time is consumed in giving this treatment "a fair trial," it is not surprising that in many cases where there is a tendency to spontaneous recovery, they should have got the credit of effecting a cure. I do not think you will gain much by their use, except aiding the patience of the sufferer and his friends, by giving them the satisfaction of "doing something," while waiting the result of reparative changes. It is certainly, however, an advantage, if by prescribing them we can insure a regular and sustained friction over the affected part, and mechanical manipulation of the paralyzed muscles, in the way of pressing, kneading, passive movements of joints, etc., and thus, by improving the circulation and nutrition in the muscles, influence favorably the degenerative changes which we have seen make such an important element in peripheral paralysis.

Although it is with many a matter of course to prescribe strychnia whenever muscles are paralyzed, whatever be the cause, I do

not think you will derive any benefit from it here, either administered by the mouth or by subcutaneous injection of it immediately about the affected region. This substance exerts its effects upon the spinal cord, and you will remember that we have here a severance of the paralyzed muscles from that organ as the condition to be combated. If we tetanize our patient with strychnia, the muscles implicated in a peripheral paralysis will take no part in the general contractions.

The remedy I have found most useful in peripheral paralysis, the remedy *par excellence*, is electricity, either the induced or galvanic current. While many regard it a matter of indifference which of these two sorts of electricity we employ, I must say that, in the great majority of cases, I give the decided preference to the galvanic or constant current; though I advise you not to use either exclusively to the neglect of the other, but seek to combine their employment in your treatment. In the lighter cases, where the induced current produces contractions in the paralyzed muscles, even after some time has elapsed, I think its use quite sufficient for our purposes, though even here I prefer to alternate it with the galvanic current. In the severer cases, those marked by considerable atrophy, and "degenerative reaction," I have no hesitation in telling you that, to give the best chance of recovery to our patient, we should employ the galvanic current. Mark well. I do not advise you to abandon the use of the induced current in these cases; if it is the only kind of electricity you have at command, it should be persistently tried, even though for a long time you can perceive no good results. I wish you to fix your attention on the fact that it is not by producing contractions in the muscles that we hope to cure the paralysis; the causing contractions by the induced current is not in itself curative; it is only a sign that the degeneration of nerve and muscle has not proceeded to a great degree, or that regeneration has begun in them. You will often have occasion to observe that the power of the will over the muscles is

recovered before their capacity for contracting to the stimulus of electricity returns, and that, long after there is an apparently complete recovery from the paralysis, the electric excitability of both nerves and muscles remains below the health standard. In your use of electricity, do not apply it vaguely over the paralyzed parts; but call up your anatomical knowledge, and be careful to bring under its influence the particular nerves affected, and, as far as you can, the point of lesion; each muscle should receive its full share of the current. One reason for the more general applicability of the galvanic current is, its capacity for penetrating to the deep-seated parts, and so affecting directly lesions located beyond the immediate influence of the induced stream, as, for example, the facial in its course through the petrous portion of the temporal bone.

I will warn you against a very common error in the use of electricity for the cure of paralysis; it is the employment of currents of inordinate strength, partly with the intention of forcing the muscles to contract; partly, I am afraid, from no better reason than that we cannot have too much of a good thing. A moderate strength, such as the patient can easily bear if there is little or no anæsthesia, or such as will cause medium contractions in the muscles, if they are still excitable, is all that is required. If there is great anæsthesia, we must be guided as to the strength of the current by the reddening of the skin, and the application of the electrodes first to sound parts, where the patient can appreciate the effects. The length of time of a single application should not, in general, be longer than from five to fifteen minutes, and repeated not oftener than once a day, and, in general, about three times a week. In using the induced current, place the well-wetted electrodes, not far apart, successively over the course of the nerves and muscles involved, so that all parts shall be, as far as possible, brought under its influence.

The galvanic stream must also be applied to both nerves and muscles affected. In the case before you, you see that I apply the

anode to an indifferent spot, as the patella, and the cathode just below the head of the fibula, where I suppose the point of injury of the nerve is located, and thus bring the influence of the exciting pole to bear on the degenerated nerve, thus employing the polar method. Now I place the anode in the popliteal space over the nerve-trunk above the point of lesion, and the cathode I pass slowly along the course of the nerve below the point of lesion, thus seeking to obtain the salutary influence of the passage of the current through the injured part of the nerve, and along the course of its fibres in a centrifugal direction. It has been claimed that, as in experiments on animals it is found that passing the current in the reversed direction—that is, centripetal—through nerves exhausted by over-action, we “refresh” them, and more quickly restore their activity, so in peripheral paralysis we may hope for a recuperative effect by sending this centripetal current through the injured nerve-trunk. From my experience, I can tell you nothing certainly about this, but I hope you will make it the subject of your own observations. In applying galvanism to the muscles, I place the anode, you see, on some indifferent spot, say the patella, and stroke each of the muscles with the cathode. This movement of the electrode has somewhat the effect of breaking the current, while you increase the exciting action. In using galvanism for facial paralysis let me remark that, while we place the anode upon the mastoid process, and apply the cathode to the several branches of the nerve, we must be careful in the application to the supra-orbital branch, as the current, from its power of penetration, may produce unpleasant symptoms by its effect on the cerebrum.

If now you ask me *how* the use of electricity acts curatively in peripheral paralysis, I am free to confess that I think our ideas on that subject rather vague. We know that by its use it causes an increased flow of blood to the part; an indication of this we have in the reddening of the skin. The circulation is improved by stimulating the muscular coat of the vessels, relaxed by the par-

alysis of the vaso-motor nerves, and so combating the tendency to passive congestion and its accompanying alteration in nutrition, especially of the connective tissues. Do we affect the molecular nutrition of the nerves and muscles? I am inclined to answer in the affirmative. Electricity, we know, increases the irritability of nerves, and enables them to respond to a weaker stimulus. One thing is certain, for recovery we must have a regeneration of nerve-fibres which have been destroyed or seriously impaired in their organization, and this must be the work of time. Does electricity assist in this regeneration by stimulating the formative elements to increased activity, whether they be the nuclei of the primitive sheath, the colorless corpuscles of the blood, or the homogeneous mass of dissolved white substance of Schwann, and axis cylinder? Be this as it may, I must impress on you that a very long and careful use of this remedy must be tried, even when you see no good results, before you abandon it as useless or declare the paralysis hopeless. Even after the degenerative reaction itself had disappeared—a symptom regarded by Erb as indicating the complete degeneration of the striated substance of the muscle, and looked on by him, I think, as a hopeless sign—I think you should continue your efforts. I recall one case of facial paralysis where, after a month of galvanic treatment, the degenerative reaction, which had faded out, gradually reappeared, and the patient made a good recovery. Observe that you cannot certainly arrest the degenerative changes which an injury to a nerve trunk has set up, even if you begin before that degeneration has made progress. It might be expressed that these changes pass through a curve, the lowest point of which must be touched before the ascent begins. I believe the proper use of electricity prevents the changes from stopping at the lowest point, and materially hastens them when they are moving upwards toward structural and functional integrity.





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